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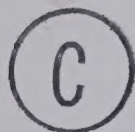
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NETWORK ANALYSIS OF WORKTRIPS OF THE CITY
OF EDMONTON BASED ON THE ORIGIN AND
DESTINATION STUDY

B Y



HENRY CHIAT SENG NG

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
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UNIVERSITY OF ALBERTA
FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled NETWORK ANALYSIS OF WORKTRIPS OF THE CITY OF EDMONTON BASED ON THE ORIGIN AND DESTINATION STUDY submitted by HENRY CHIAT SENG NG in partial fulfilment of the requirements for the degree of Master of Science.

ABSTRACT

The establishment of travel patterns and trends of work-trips in an urban centre is essential in the design of a transportation network or the capacity of a facility. Work-trips constitute the largest single travel movement by purpose during the peak-hour of traffic. For this reason, peak-hour work-trip movements are often the basis of transportation design.

The various vital factors that contribute to the change of peak-hour patterns must be isolated and their relationships and effects studied; so as to provide for greater flexibility for future transportation policies to cater for higher overall efficiency. These aspects were extensively covered in the first portion of this thesis. The investigations examined the changes of travelling habits of the morning home-to-work trips of downtown employees of Edmonton during the period of 1961 to 1967.

Observations were made of the Home Interview Origin-Destination (O-D) characteristics and their related usefulness and significance when compared with those of the actual travelling patterns. The main purpose of this procedure was to test the direct usability of the basic Origin-Destination data to predict critical traffic conditions. Attempts were made to derive multipliers from which the O-D data could be expanded to a more complete basis-information. A statistical correlation of the cordon count and the O-D data showed that the

average worker arrived at the Central Business District (CBD) boundary $7\frac{1}{2}$ minutes before his starting time of work. Qualitatively, the O-D survey was established as having been made on only 85% of the population.

The final part of the thesis was devoted to the checking of the reliability of the collected O-D data by means of simulation of actual travel movements from home-to-work with the help of the 'tree-building' and 'minimum path' programmes. The investigation considered the entire city as the extended area of study with particular emphasis on all cross-river traffic at the bridges. Major street network system of the entire city was decoded to be used for traffic assignments, where all auto-driver work-trips of 1967 (O-D) were assigned on the basis of minimum time of travel. These were then compared with the vehicular counts tallied by traffic counters set up on the bridges. It was shown that 'minimum time' could not be used as being the only prime factor in the determination of a traveller's choice of routes.

Peak hour and overall travel characteristics of work-trips of Edmonton were applied to the trip generation and attraction equations derived by the Winnipeg Area Transportation Study (WATS). Results shows that a fairly accurate work-trip imposition on a traffic system or location could be quickly and easily worked out by means of these equations. This would eliminate the need of having enormous amount of information on trip movements.

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1. The Traffic Engineering Department
2. Edmonton Transit System

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CHAPTER 1

INTRODUCTION

The journey to work is an activity very common in our daily lives. However, a very noticeable and striking characteristic of this movement is its surprising consistency in performance and occurrence at virtually the same time for most people. In the mornings, movements traverse from home to work and in the evenings, in the opposite direction. Due to the nature of travel made from the home to the workplaces (and vice versa) at almost the same time, there is a tremendous effect on the capacity requirements of an urban transportation system. For this reason, the peak-hour loading characteristics are the basis of design for any transportation plan or facility.

The Origin-Destination (O-D) survey is intended to gather information on the number and types of trips made from the various origin zones to their respective destinations. Its purpose is primarily to provide valuable information to legislative bodies in their formulation of overall policies. These compiled data could also be source material for appraisal of transportation deficiencies. From the standpoint of transportation network analysis, work-trips constitute the largest single travel movement by purpose during the peak hours. Much attention should therefore, be focussed on the planning for efficient systems of providing mobility to and from work. A significant measure of the adequacy of a transportation network is its ability to accommodate the

enormous daily movements of persons on their journey to work. Only through a greater and more complete awareness and understanding of the underlying determinants of traffic flows; and the extent of problems that can be created by an inefficient circulatory system, can improvements be facilitated effectively.

This study investigates the reliability of using O-D data of the City of Edmonton as a tool to simulate travel characteristics of the daily work-trip flows. One cannot overstress the usefulness of analysing the journey to work with regard to factors affecting trip generation on a network system, the patterns of confluence at the destinations and other related aspects pertaining to trip-making. Due to time limitations, the examination of the Origin-Destination data and its trip characteristics had to be confined to morning home-to-work activities (7:00 to 9:30 am). However, the author feels that the methods used for analysis of trip-making in this thesis need not be confined to these hours alone, if there is sufficient data available.

STATEMENT OF THE PROBLEM

The Origin-Destination survey is designed to gather information on trip characteristics in an area of study with emphasis on the mode of transportation utilised, the origin and destination conditions and the time of day the trips were made. This set of data can then be used to assess the efficiency of the present transportation network system and also to provide a 'feed-back' to the policy formulating bodies in their establishment of new transportation plans and policies. Effective arrangements of routes and schedules both for buses and rapid transit can be based on this information. But, before any raw sets of data can be used as the basis of prediction, they must be tested qualitatively and quantitatively for completeness and reliability.

The main aim of this thesis is to determine accuracy of the O-D survey data as obtained by the Traffic Department and make the necessary adjustments so that the information can be of direct use in the simulation of actual traffic loading conditions on the transportation network. Attempts can then be made from these simulations to devise techniques and derive multipliers for travelling behaviour patterns (especially the work-trips) under varying loading conditions on a system. Also, peak-hour patterns, both the morning and evening conditions have to be examined for inter-relating characteristics.

The validity of the simulating techniques applicable to micro-area zones must be studied for deviational effects when applied to an extended area of study. This can be accomplished, in this study, by comparing the simulated bridge crossing traffic from one side of the river to the other with those of the actual field conditions.

Investigations will also be extended to study the applicability of the available land-use information of the origin and destination zones for the determination of generated and attracted traffic volumes both for the large and micro-area. This could mean that accurate traffic volumes on a system might be estimated easily without having to have enormous data on trip-making.

LIMITATION OF THE STUDY

It was originally the intention of the author to study the travel behaviour of the population of the City of Edmonton. Due to the lack of more complete information regarding movements of persons by purpose, the investigation had to be confined to only the work-trips. The methods of analysis were used in such a way that they would be applicable for analysing movements by any purpose, independently or combined.

Although the accuracy of the simulated travel movements of work-trips of 1967 compared favourably with field conditions as noted during the cordon count, the lack of the latter information previous to 1967 disrupted the intended method of establishing travel patterns and trends for the journey to work during the period 1961 and 1967. The only other earlier available cordon count was done in 1961 on a 10% sample basis. This meant that a less direct method had to be incorporated, by using the O-D datas of 1961, 1964 and 1967 together with the observations made by Walker and Bakker (1964) and Rhyason (1967). Fortunately, the degree of accuracy of the 3 O-D datas were consistent enough to render the established travel trend as representative.

Before the simulation of traffic flows through the City of Edmonton can be performed, the street network links had to be decoded for travel time, distance and travelling speed involved. This was an extremely time consuming procedure. As a result, the decoding had to be confined to travel characteristics of the morning peak flow conditions. If the

analysis was to be performed for other times of the day, different sets of travel time decodings would be required since the speeds and direction of heavy loading conditions would be different. The lack of time did not permit the author to decode another set of travel time. However, during the decoding, provision was made for additional insertions of links into the system. This facility was implemented such that new links may be tested without having to re-decode for the entire system.

CHAPTER II

REVIEW OF PREVIOUS WORK

There has been a number of studies carried out in the City of Edmonton concerning transportation network study. Among them is one by Rhyason (Rhyason, 1967), who investigated into the effects of transportation changes, area of employment and parking availability on the modal split relationships for a home-to-work movement destined to the C.B.D. Halls (Halls, 1968) in his thesis developed a technique for predicting the operational characteristics of possible transit system alternatives that would be required to attain various levels of ridership. In 1964, the City conducted an employee O - D survey in conjunction with the Civic Census to interview all households in the City, Jasper Place (then not part of Edmonton) and St. Albert to determine place of work, mode of transportation used and time of starting work. 1961 saw the Metropolitan Edmonton Transportation Study (M.E.T.S.) survey of the entire city on a 10% sample.

In Rhyason's investigations, he used data from the 1961 and 1964 O - D surveys from the City of Edmonton transportation study zones, 1961 auto travel times from the M.E.T.S. and 1961 and 1964 transit travel times. Because there were no major changes in the street network, he made the assumption that auto travel times for 1964 were the same as those of 1961. However, this proved inaccurate and he had to impose a

'bridge penalty' for auto trips coming to work across the North Saskatchewan River from south side origin zones. Rhyason also investigated into the various changes of population, employment and travel activity during the period 1961 to 1964. This information was very helpful in this study. The conclusions reached by Rhyason included:-

- i.) Economic status and relative travel times are the chief factors affecting the choice of mode in Edmonton.
- ii.) The modal split relationships in Edmonton are dependent on the area of employment within the C.B.D.
- iii.) House-sale value was a reliable measure of economic status.
- iv.) Relative travel time can be measured with equal reliability by both travel time difference and travel time ratio.

Halls' thesis was concerned with the developing a computer programme that would trace the shortest path through a transportation network between two points. The minimum time path programme was used quite extensively in this thesis for tracing and assigning minimum travel time and route taken of worktrips from origin centroids from one side of the river to destinations on the other side. Halls recommended that 'test networks should have the centroids located off the network, connected to it by dummy links representing the position of the excess travel time which occur ' and suggested that the use of this method would simplify the testing of alternatives.

In the analysis of the 1964 Census, Bakker and Walker found

that 35% of the CBD employees came to work by transit in that year. They also established that the older areas in the CBD had a reduction in employees while the outlying area had a substantial increase indicating a migration outwards of the CBD employees during the period 1961 to 1964. An excerpt of their progress report can be found in Appendix A.

CHAPTER 111

THEORY

An 'Extension' to the Gravity Model

The concept of gravitational attraction similar to those of Sir Isaac Newton's Laws of Gravity was recently introduced to traffic studies and has since been developed into a mathematical relationship called the 'Gravity Model'. This model has frequently reflected its ability to reproduce traffic distribution and generation patterns quite similar to actual conditions. However, the nature of many of its mathematical constants have not yet been established for their true identity when applied over a period of time. In mathematical terms, the model can be described as:-

$$T_{ij} = T_i \frac{K_{ij} \cdot A_j / t^p_{ij}}{\sum_{x=1}^n K_{ix} \cdot A_x / t^p_{ix}} \quad \text{for all } x \neq i.$$

where T_{ij} = interzonal trips from zone i to zone j.
 T_i = interzonal trips originating from zone i.

$$= \sum_{x=1}^n T_{ix} \quad \text{for all } x \neq i.$$

A_j = interzonal trips ending in zone j.

K_{ij} = zone-to-zone "adjustment" or "calibration" factor.

t_{ij} = travel impedance (usually time together with variations of distance and cost) for trips moving from zone i to zone j .

p = exponent of travel time or resistance for trips.

n = number of zones in the region.

If the actual trip distributory factors of arrivals at the destination by time are known, an 'extension' to the gravity model may be implemented to allocate and readjust trips such as to reproduce a traffic arrival pattern based on the above distribution factors.

The Moore Algorithm* (Traffic Assignment Manual, U.S. Dept. of Commerce, 1964) bases its principles on the concept that in traffic assignments, the trip interchanges are assigned to those routes which offer the least resistance to travel in terms of time, distance and cost. This concept is very similar to the selective path of the electric current going through a maze of resistors. This algorithm was quite clearly explained by Halls (Halls, 1968) when used for the development of the minimum time path trip programme, and has been reproduced in Appendix B. The errors generally involved in traffic assignments of this nature can be reduced if the simulated link volumes are combined to reflect the general traffic demand and be restricted by forms of capacity restraint on particular links in a network.

* An algorithm is defined as the specific routine for the solving of a given problem.

APPROACH TO THE PROBLEM

ESTABLISHMENT OF TRAVEL TREND

While good transportation policies are often the themes of success for a healthy urban plan, it is nevertheless important to consider the impact and effect of the growth pattern in the area before these policies can be made operative. Plans can only be successfully implemented through clear understanding and awareness of the basic factors that contribute to growth and behaviour changes. In the same way, good effective transportation plans are derived from the isolation and study of the changing environmental conditions and travelling patterns of the population.

This section examines the 1964 and 1967 home-to-work travel characteristics bound for the CBD, to detect for changes of travel trends of work-trips with particular reference to changing environmental situations such as population, employment, street and transit networks during this period. The investigation uses the information of the 1964 and 1967 Origin-Destination surveys as sources of information. Previous work conducted by the City in 1964 and Rhyason (1967) examined the employee and travel movement characteristics in the downtown area for the period 1961 and 1964. An additional cross-check with these results will extent the trend establishment to the period 1961 to 1967.

The Origin-Destination data was based on a series of questions asked as part of the Civic Census. Figure III-1 shows the questionnaires

in the form of IBM cards which were filled out by census-takers for the people in the home interviews of 1964 and 1967 Origin-Destination Surveys.

FOR OFFICE USE ONLY			ITEM 1		ITEM 2		ITEM 3		ITEM 4		ITEM 5		ITEM 6		ITEM 7		ITEM 8	
DISTRICT M.E.T.S.	ORIGIN ZONE M.E.T.S.	DESTINATION ZONE M.E.T.S.	LOCATION OF EMPLOYMENT		1-10 P.M.	11-12 P.M.	13-14 P.M.	15-16 P.M.	17-18 P.M.	19-20 P.M.	21-22 P.M.	23-24 P.M.	25-26 P.M.	27-28 P.M.	29-30 P.M.	31-32 P.M.	33-34 P.M.	35-36 P.M.
C0	C0	C0	C0	C0														
C1	C1	C1	C1	C1														
C2	C2	C2	C2	C2														
C3	C3	C3	C3	C3														
C4	C4	C4	C4	C4														
C5	C5	C5	C5	C5														
C6	C6	C6	C6	C6														
C7	C7	C7	C7	C7														
C8	C8	C8	C8	C8														
C9	C9	C9	C9	C9														

1964 EDMONTON CENSUS

INSTRUCTIONS

ITEM 1 - WRITE CLEARLY THE NEAREST STREET AND AVENUE INTERSECTION OR THE NAME OF BUILDING AT WHICH THE PERSON IS EMPLOYED.

ITEM 2 - MARK THE CORRESPONDING BUBBLE (SEE BELOW) THAT INDICATES THE TIME NEAREST WHICH THE EMPLOYEE STARTS WORK (A.M. ONLY) MARK "OTHER" IF HE STARTS AFTER 9:30 A.M.

ITEM 3 - MARK "FIRST" FOR THE FIRST CARD ONLY AT EACH HOUSEHOLD. MARK "OTHERS" FOR CARDS OF REMAINING PEOPLE THERE WHO ARE EMPLOYED.

ITEM 4 - MARK A NUMBER IN THIS COLUMN IF YOU MARKED "FIRST" IN ITEM 3, OTHERWISE LEAVE BLANK

ITEM 5, 6 & 7 - MARK ONE IN EACH COLUMN

HOW TO MARK A BUBBLE

BEFORE

AFTER

A SINGLE STROKE THROUGH BUBBLE

FOR OFFICE USE ONLY			ITEM 1		ITEM 2		ITEM 3		ITEM 4		ITEM 5		ITEM 6		ITEM 7		ITEM 8	
DISTRICT M.E.T.S.	ORIGIN ZONE M.E.T.S.	DESTINATION ZONE M.E.T.S.	LOCATION OF EMPLOYMENT		1-10 P.M.	11-12 P.M.	13-14 P.M.	15-16 P.M.	17-18 P.M.	19-20 P.M.	21-22 P.M.	23-24 P.M.	25-26 P.M.	27-28 P.M.	29-30 P.M.	31-32 P.M.	33-34 P.M.	35-36 P.M.
C0	C0	C0	C0	C0														
C1	C1	C1	C1	C1														
C2	C2	C2	C2	C2														
C3	C3	C3	C3	C3														
C4	C4	C4	C4	C4														
C5	C5	C5	C5	C5														
C6	C6	C6	C6	C6														
C7	C7	C7	C7	C7														
C8	C8	C8	C8	C8														
C9	C9	C9	C9	C9														

1967 EDMONTON CENSUS

INSTRUCTIONS

ITEM 1 - WRITE CLEARLY THE NEAREST STREET AND AVENUE INTERSECTION OR THE NAME OF BUILDING AT WHICH THE PERSON IS EMPLOYED.

ITEM 2 - MARK THE CORRESPONDING BUBBLE (SEE BELOW) THAT INDICATES THE TIME NEAREST WHICH THE EMPLOYEE STARTS WORK (A.M. ONLY) MARK "OTHER" IF HE STARTS AFTER 9:30 A.M.

ITEM 3, 4, 5, 6, 7 AND 8 - MARK ONE IN EACH COLUMN

HOW TO MARK A BUBBLE

BEFORE

AFTER

A SINGLE STROKE THROUGH BUBBLE

1964 AND 1967 MARK SENSE CARDS

FIGURE III - 1

CORRELATION OF THE CORDON COUNT AND THE ORIGIN-DESTINATION SURVEY OF 1967

In August 1966, the Traffic Department of the City of Edmonton conducted a cordon count along the boundaries of the CBD to study the actual traffic characteristics on the street network within the CBD. All movements into and out of this area were counted in 15-minute intervals at the various stations located at the access points. The check-point locations of the area of study are shown in Figure III-2. This area is bounded by the east of 97 Street in the East, 109 Street in the West, 104 Avenue in the north by the rail-road tracks and the North Saskatchewan River to the South. In 1961 the cordon count used for the Metropolitan Edmonton Transportation Study (METS) was along 100 Avenue. Therefore, in 1966 a screen line was used along 100 Avenue, but the cordon was relocated along the River so as to include the Government centre.

The Edmonton Transit System conducts regular monthly passenger counts on all their bus routes. The appropriate information pertinent to the cordon count was extracted for considerations with regards to the actual traffic movements.

The combined data was then used to compare with the Origin-Destination Home Interview Survey of 1967. The primary aim was to establish a correlating factor between them and which could then be used to determine the reliability of the Origin-Destination data if used to simulate home-to work travel characteristics. The potential of using the O-D data as an instrument for future planning was to be investigated,

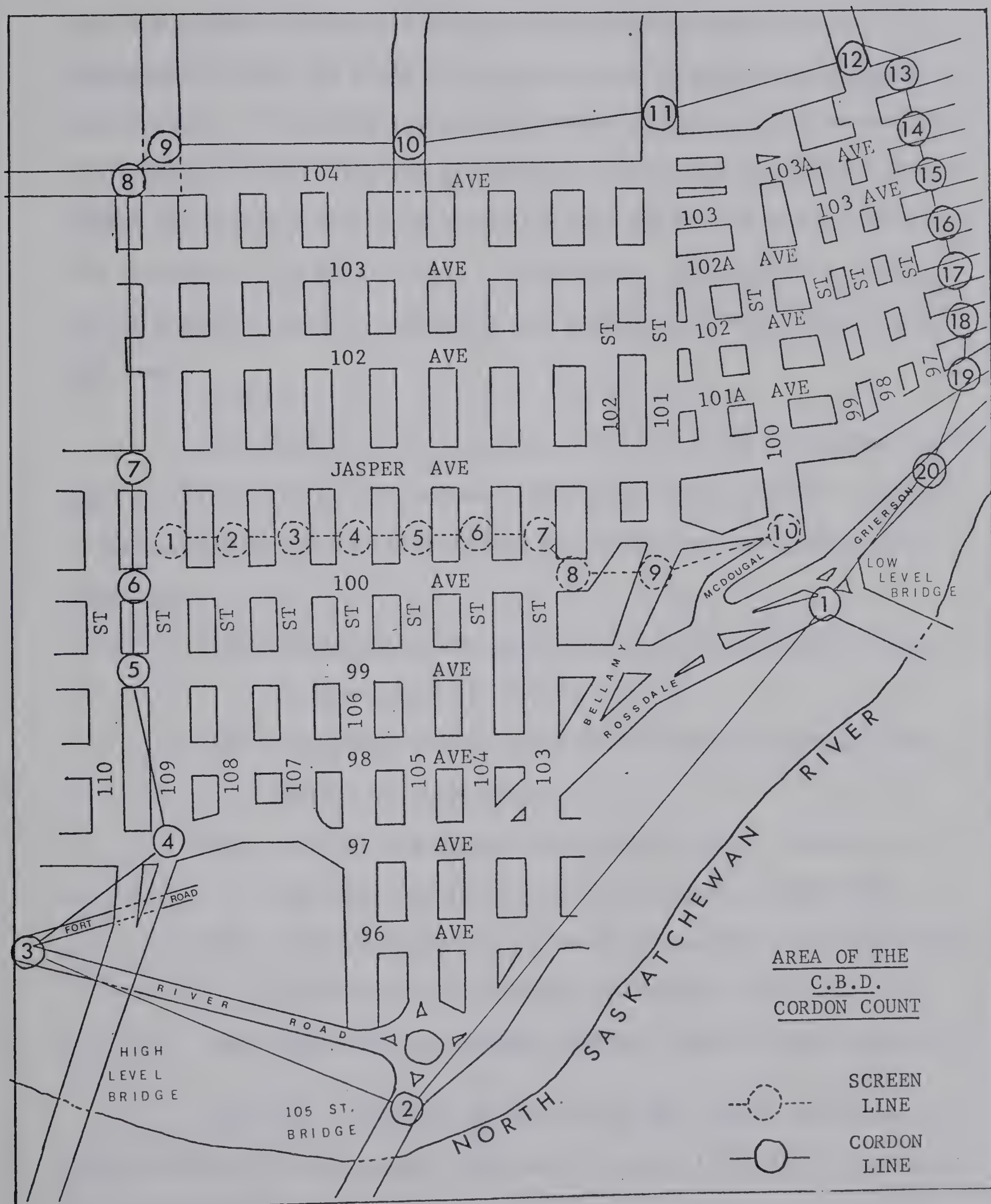


FIGURE III - 2

together with corrective adjustments, if any. The present study deals with the aspects of possible utilization of the journey to work characteristics as the basis for deriving major transportation design determinants. This would reduce the arduous task of transportation data collection by eliminating the gathering of relatively unimportant information for analysis and could save much time and effort without affecting the accuracy of the final result. Consequently, the overall transportation analysis could be speeded up and reduced to a relatively simplified form.

The statistical correlation of the O - D and the cordon count was not restricted to mere direct comparison. Various other travelling relationships of the downtown working population were analysed, which included:-

- (a) the extent of the peak-hour activity of traffic, i.e. (7.30 am. to 8.30 am.)
- (b) the volume of through-traffic traversing through the Central Business District.
- (c) the time lag between the actual arrival time and the starting time of work of the employees in the CBD.
- (d) the mode split comparison of the actual (from the cordon count) and the reported information from the O - D.
- (e) the difference between male and female travel behaviour.

Initially tabulation of work-trips was broken down into 15-minute time intervals, however, the many irregularities that existed in

the time period made correlation both difficult and awkward and also introduced a certain amount of error in the results. Consequently, the 30-minute interval was chosen as the best working time parameter because of its better representativeness of the actual travelling behaviour when used for comparison purposes. The inaccuracy of the 15 minute interval as above mentioned is illustrated in Appendix C.

In traffic planning it is quite important to study and determine the actual length of time the average worker allows himself for travelling. This has a direct effect on the loading capacity of a street-network or facility and thus must be studied in fairly great detail to facilitate checking, diversion, correction or planning. A point of usefulness that must be stressed is that although the journey to work may be considered by some to be such a 'chore', yet it is made with such consistency that its characteristics can even be predicted with a high degree of accuracy. The average person allows enough time for the 'everyday eventualities' such as peak period traffic jams and the travel time, that it is developed into a force of habit to be leaving the house at such a time and be arriving at a particular junction at another time. This consistency is extremely helpful to planners and designers since policies and urban study analysis can then be made with greater confidence, and if the critical inputs of the locations of persons and jobs are realistically delineated the prediction of travel patterns and traffic flow could be done with greater efficiency as in the case of the Winnipeg Area Transportation Study (WATS) of 1966.

The travel patterns and trends, as established in the first

part of this study was a very useful foundation stone in this thesis. Although it has been often cited in many transportation studies that the new will behave as the old, the changing trend of behaviour and attitude and whatever 'travelling sophistication' which may have been developed, have to be established before urban planning can be made effective - even though radical changes in trip-making may not be anticipated.

Details of description of the trip-maker regarding his socio-economic position, automobile ownership, location of residence and work, the mode of transportation utilised, the distance and time taken in the home-to-work trip, the time of arrival and the parking availability at the destination and whatever excess time* that he has to allow for his journey to work have to be collected and analysed. This way, the critical loadings and deficiency in a link on the network or a facility for a particular time period can be quickly determined and identified. In this section of the investigation the prime interest is the manner of confluence at the destination zones in the CBD. Efforts were made to trace the actual arrival time of employees in the CBD and the mode of transportation used, and therefore use of any of the excess time information were done very selectively to obtain the most representative results.

* Excess time includes the following:-

- (a) time taken to walk from point of origin to transportation facility.
- (b) time spent waiting for transportation and/or transfers.

- (c) time spent looking for a parking space in the case of auto drivers.
- (d) time taken to walk from the transportation facility to the point of destination.

ASSIGNMENT AND SIMULATION OF CROSS-RIVER TRAFFIC FLOW

Recent urban transportation studies (including the one by Roberts in Highway Research Board Record # 250 in 1968) have indicated through statistics that the gravity model can be used to adequately produce trip distribution patterns very similar to those given in the O - D home interview data. Based on this capability feature shown by the gravity model, the assignment procedure can be 'extended' one step (See Theory in Chapter III, Page 10).

The actual time-of-arrival trip ratio at each destination zone is established for each 30-minute interval. This is used as the attraction ratio by time for the assignment of worktrips from each origin zone to the appropriate destination during the period 7.00 to 9.30 am. in the same 30-minute interval. The 1967 O - D home interview survey data was the source of information in the execution of this step.

The trips that were calculated were then assigned to the street network decoded previously for the 'tree-building' and minimum time path trip programme. The high speed electronic data processing technique facilities of the University of Alberta Computing Centre was used for this purpose. Details and listing of the programmes used are contained in the Appendix D. This produced the simulated traffic loadings on the links in the network system. The natural profile of the North Saskatchewan River was used as a screenline for the examination of all cross-river activity were located at the bridges.

The traffic department of the City of Edmonton has set up

counters at these points to study the actual traffic loadings at the bridges at various times of the day. This information was a very good means of correlating and testing the accuracy of the above cross-river traffic simulation.

It should be noted that the mechanical counters on the bridges can only give information regarding vehicular activity at these points. This meant that any form of direct comparison would have to be confined to auto-driver trips and number of buses using these river-crossing facilities.

It was the intention of this thesis to analyse and ascertain the relationship that existed between the bridge-crossing correlation and the CBD worktrip correlation.

CHAPTER IV

PROCEDURE

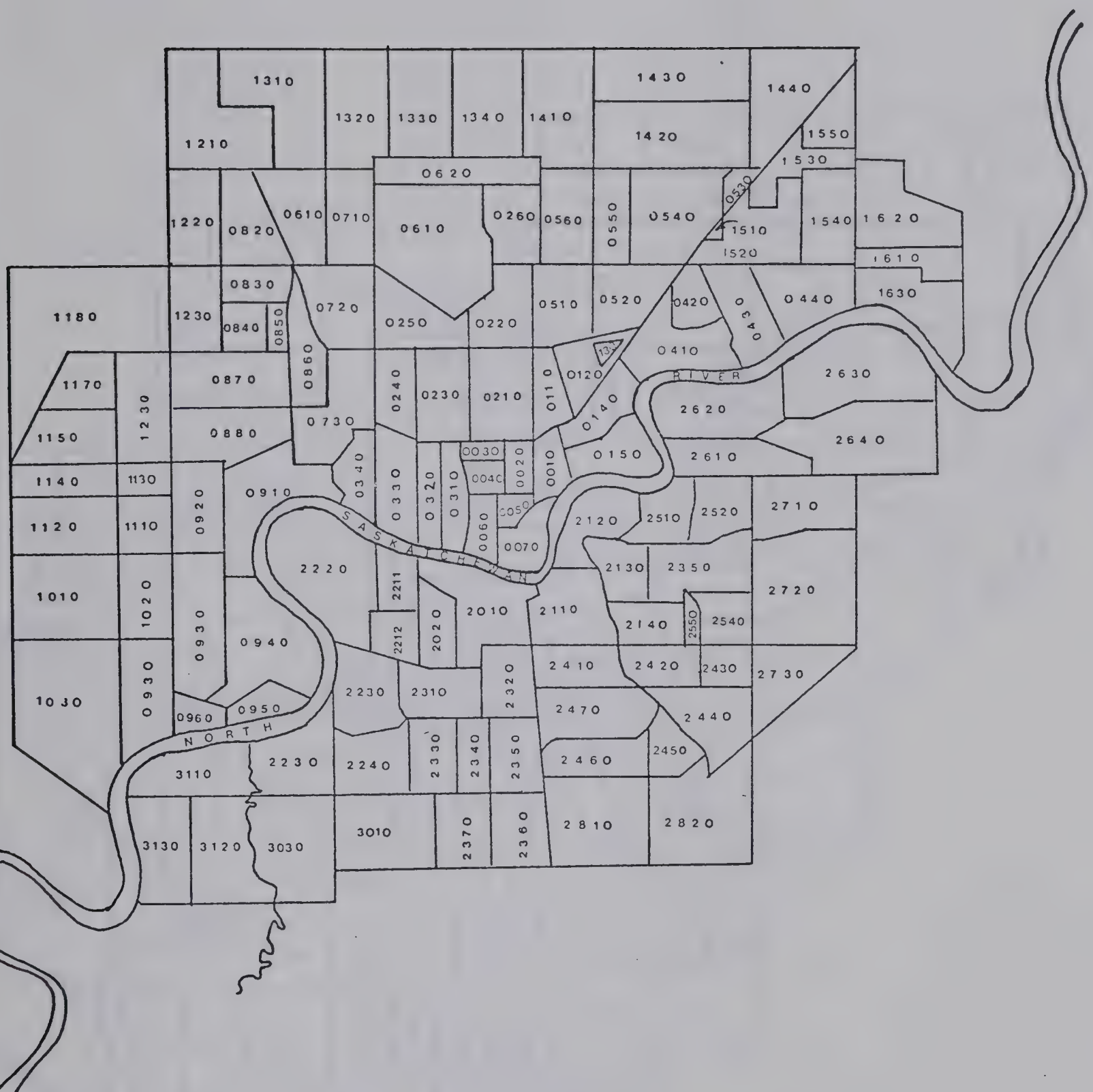
1. TRAVEL TREND ESTABLISHMENT

The Edmonton Study Area for the 1964 and 1967 O - D home interview survey is shown in Fig. IV-1 and Fig. IV-2 respectively. All changes with regards to environmental conditions such as population, employment, boundary, land-use and street and transit network changes were observed and recorded. The 1961 population and employment data were also included in the compilation.

In this section the main aspect of consideration was the observation of difference in pattern of home-to-work trips bound for the Central Business District. The CBD comprises of zones 0010-0070, the zone centroid* equivalence numbering 1 to 7. Zoning and its demarcation was along the same lines as those used in the Metropolitan Edmonton Transportation Study (METS) of 1961 (Rhyason, 1967). The CBD zone area together with the land-use description is shown in Fig. IV-3.

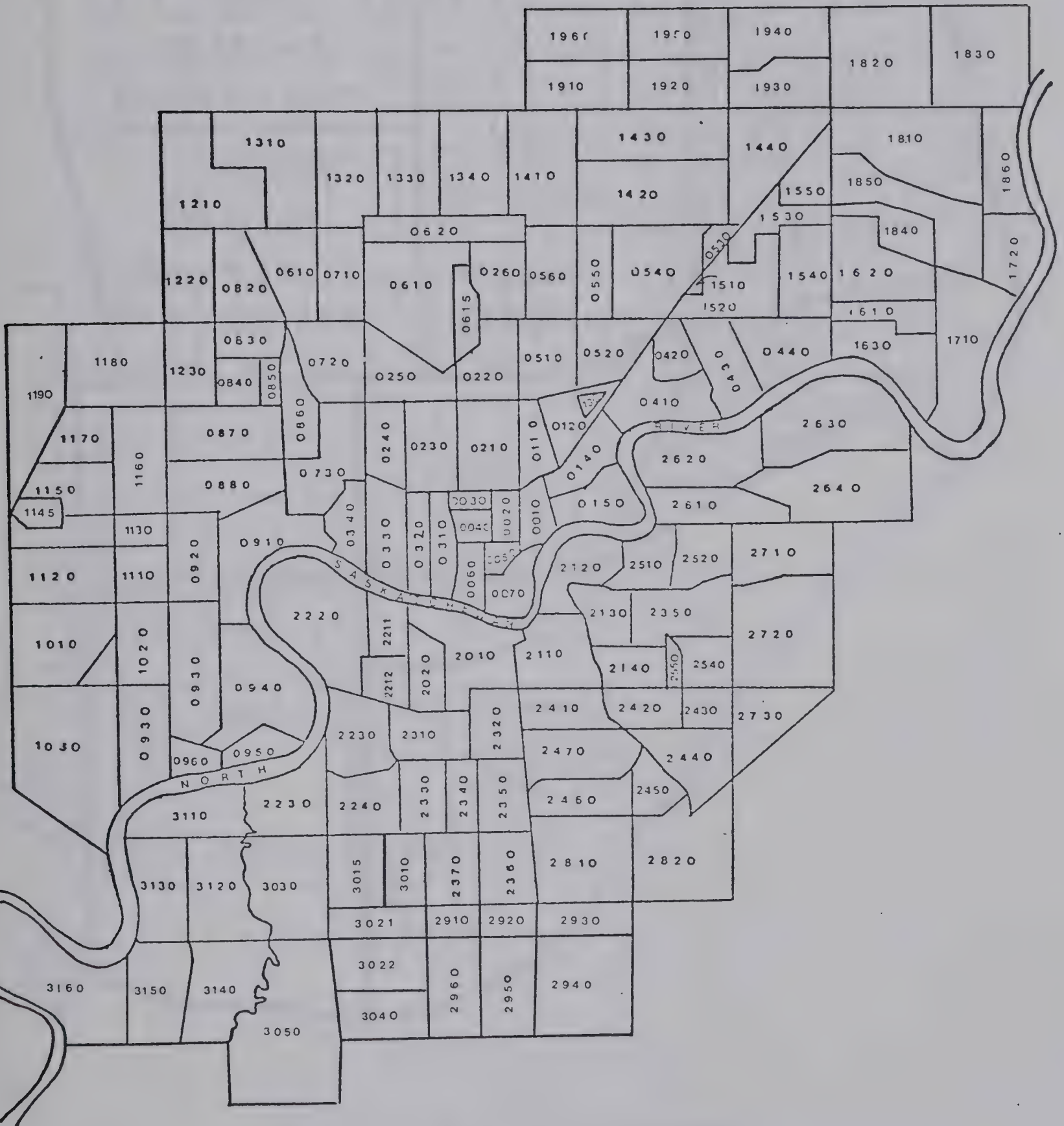
Zonal employees starting time of work and their modes of transportation were tabulated in 15 and 30-minute intervals for the 2 Origin-Destination surveys (for times up till 9.30 am.). Calculation of

* Zone centroid is the location within a zone of the centre of gravity of activities in the area.



STUDY AREA OF THE CITY OF EDMONTON
(HOME TO WORK SURVEY OF 1964)
BY TRAFFIC ZONES.

FIGURE IV - 1



STUDY AREA OF THE CITY OF EDMONTON

(HOME TO WORK SURVEY OF 1967)

BY TRAFFIC ZONES.

FIGURE. IV - 2

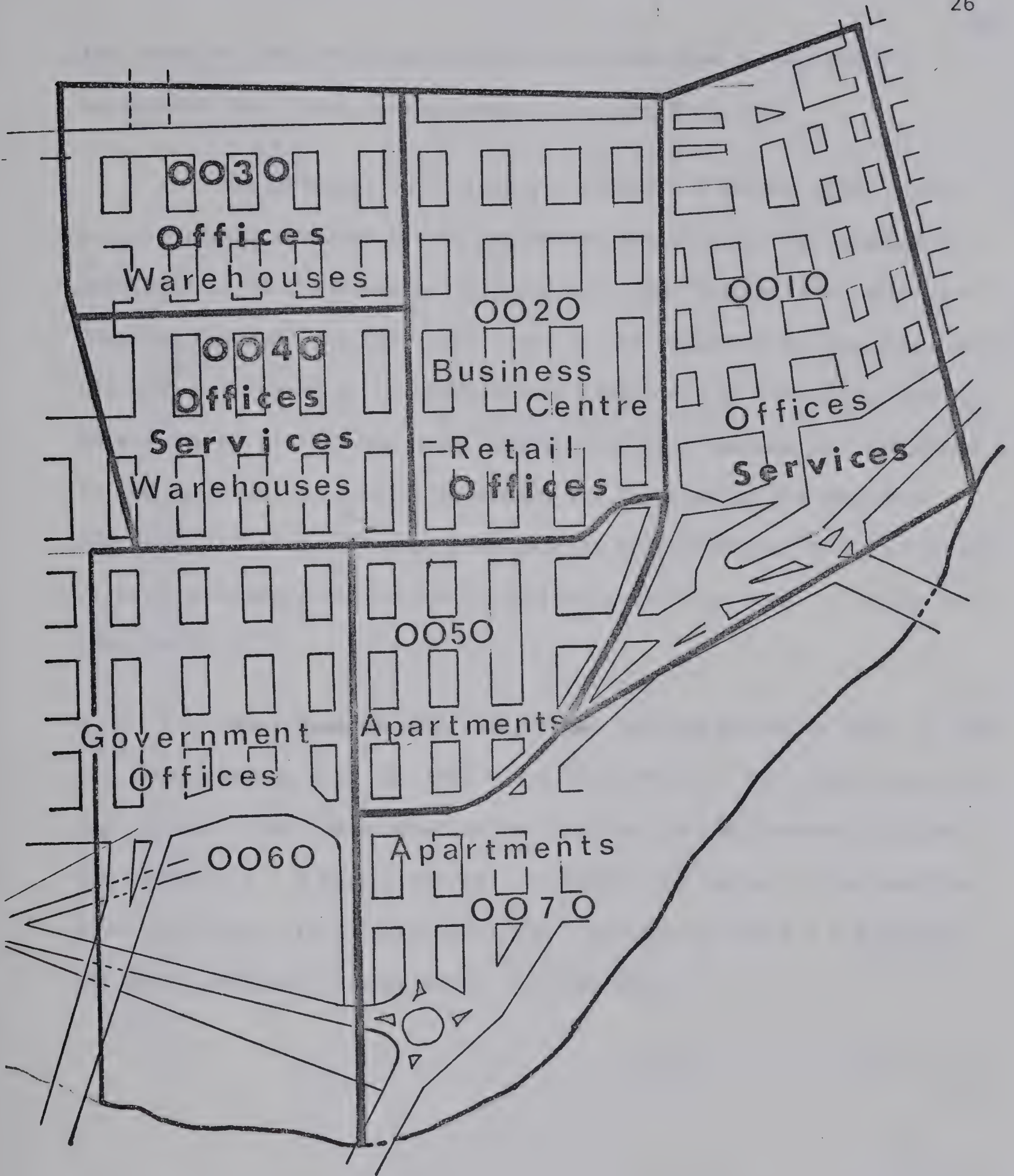


FIGURE. IV-3

ZONING AND THE LAND-USE DESCRIPTION
OF THE CENTRAL BUSINESS DISTRICT.

the ratio of the number of employees starting work to the overall employment conditions in the Central Business District.

The information of 1964 and 1967 O - D broken into regular intervals were examined by the regression analysis for all statistical implications of the trend of this period. The "Simple Correlation and Plotting Package" (CS 022 - available in the Computing Science Programme Library) written by V. E. Yanda of the Department of Computing Science, University of Alberta was used. Details of this package are contained in the Appendix D. Special attention was focussed on the peak-hour characteristical activities, such as time of occurrence, ratio of work-trips, percentages and number of employees starting work. (Tables IV-1, IV-2 and IV-3)

The travel pattern established for the period of 1964 to 1967 was then compared with the 1961 O - D (from METS of 1961) and also with the previous trend determination for 1961 to 1964 by Rhyason (1967) and the employee O - D survey carried out Bakker and Walker in conjunction with the City's Civic Census of 1964. Excerpts of the O - D Employee Survey of 1964 are reproduced in the Appendix A.

TABLE IV - 1

STARTING TIME OF WORK FOR THE CENTRAL BUSINESS DISTRICT
(1964 Origin - Destination Survey)

<u>ARRIVAL TIME</u>	<u>DESTINATION ZONES</u>							<u>GRAND TOTAL</u>
	0010	0020	0030	0040	0050	0060	0070	
7.15 am	244	144	69	66	11	60	15	609
7.30 am	317	259	97	184	25	161	15	1,058
7.45 am	167	177	55	77	19	169	5	656
8.00 am	1922	2025	651	1011	168	1364	114	7,255
8.15 am	226	229	96	102	21	347	5	1,026
8.30 am	2406	2209	354	812	178	2204	55	8,217
8.45 am	151	176	7	62	10	50	3	459
9.00 am	1608	1874	101	430	83	211	12	4,319
9.15 am	56	154	4	10	2	4	0	230
9.30 am	193	313	17	38	5	15	2	583
Total up till 9.30 am.	7289	7560	1451	2792	522	4572	226	24,412
Others	2276	1253	250	522	68	328	76	4,773
Overall Total	9565	8813	1701	3314	590	4900	302	29,185

TABLE IV - 2

STARTING TIME OF WORK FOR THE CENTRAL BUSINESS DISTRICT
(1967 Origin - Destination Survey)

<u>ARRIVAL TIME</u>	0010	0020	0030	0040	0050	0060	0070	<u>GRAND TOTAL</u>
7.15 am	340	167	65	116	12	120	17	837
7.30 am	468	266	85	194	13	176	20	1,222
7.45 am	220	133	66	72	4	99	2	596
8.00 am	2904	1812	476	927	78	1024	109	7,330
8.15 am	323	195	55	162	11	283	2	1,031
8.30 am	3016	1773	264	855	76	2006	25	8,015
8.45 am	159	174	3	46	5	14	2	403
9.00 am	1146	1333	43	391	47	117	4	3,121
9.15 am	46	128	1	12	1	3	0	191
9.30 am	175	257	1	29	4	6	0	472
Total up till 9.30 am	8837	6238	1059	2804	251	3848	181	23,218
Others	2510	1036	225	522	66	308	61	4,728
Overall Total	11347	7274	1284	3326	317	4156	242	27,946

TABLE IV - 3

COMPARISON OF RATIO OF WORKTRIPS TO THE TOTAL WORKTRIPS BOUND FOR THE CBD
(1964 and 1967 Origin - Destination Survey)

<u>TIME OF ARRIVAL</u>	<u>1964</u>				<u>1967</u>			
	<u>NUMBER OF WORKTRIPS</u>	<u>RATIO OF WORKTRIPS</u>	<u>CUMULATIVE RATIO OF WORKTRIPS</u>	<u>PEAK HOUR RATIO</u>	<u>NUMBER OF WORKTRIPS</u>	<u>RATIO OF WORKTRIPS</u>	<u>CUMULATIVE RATIO OF WORKTRIPS</u>	<u>PEAK HOUR RATIO</u>
7.15 am	609	0.021	0.021	0.589 for 17154 Worktrips	837	0.030	0.030	0.607 for 16972 Worktrips
7.30 am	1058	0.036	0.057		1222	0.044	0.073	
7.45 am	656	0.023	0.080		596	0.021	0.094	
8.00 am	7255	0.249	0.328		7330	0.260	0.354	
8.15 am	1026	0.035	0.363		1031	0.037	0.391	
8.30 am	8217	0.282	0.650	0.589 for 17154 Worktrips	8015	0.289	0.680	0.607 for 16972 Worktrips
8.45 am	459	0.016	0.661		403	0.014	0.694	
9.00 am	4319	0.148	0.809		3121	0.112	0.806	
9.15 am	230	0.008	0.817		191	0.005	0.811	
9.30 am	583	0.020	0.837		472	0.017	0.828	
OTHERS	4773	0.163	1.000		4728	0.172	1.000	
TOTAL	29185	1.000	-		27946	1.000	-	

2. The Correlation of the Cordon Count with the Origin-Destination

Survey of 1967

Home-to-work trips into the CBD were taken from the home interview survey of the 1967 O - D and tabulated into their respective characteristics such as mode of transportation utilised, the time of starting of work, the peak hour activity and male and female employment strength in the downtown area. Modes of transportation were of particular interest especially in the volumes of transit workers, auto-drivers and auto-passengers. From this detail breakdown, relevant comparison between one mode of transportation can be compared with the other.

The cordon count was basically a record of all the inbound & outbound traffic with the CBD area of study. The difference between the inflow and outflow volumes would yield the accumulated traffic within the area of cordon. For this study the accumulated volume was taken to be the actual worktrips in this region for a particular time interval under consideration. It should be noted that while this assumption would generate a certain amount of error especially with the 'transient trips' within a time interval. The error was found to be only prominent if the time interval of consideration was relatively short because the percentage of transient trips would be quite substantial compared with the accumulated volumes (see Appendix C). Consequently other time intervals were studied for their potential as good time representation of work-trip patterns. The 30-minute time interval was chosen as

the most representative overall travel parameter to be used for comparison with the O-D data.

The area of cordon count in the CBD area is shown in Fig.

III-2. All accesses into this area were 'sealed off' by placing both people and mechanical counters to record the traffic moving into and out of this region. Advantage was taken of the natural barriers such as the North Saskatchewan River in the south and the Canadian National railroad tracks to the north on 104th Avenue. The eastern border was drawn on the east of the 97th Street, and in the west on 109th Street. A compilation of the total activity during the period 7.00 to 9.30 am from this count is shown in Table IV-4. In addition, the total amount of through traffic activity through the cordon area was examined.

Direct statistical and graphical correlation of the various modes of transportation of both the O - D and the accumulated cordon traffic were attempted using the following two parameters:-

- (a) the 15-minute time interval (this was later changed to 30 minutes because it was felt that the former condition was too short a time to be representative of actual travel. There were quite a few irregularities that were quite distinct which made results inconsistent).
- (b) the cumulative traffic of the entire morning worktrip movement in this area.

Tabular and graphical illustrations of these correlating attempts are shown and discussed in greater detail in 'Results and Discussion'

TABLE IV - 4

DOWNTOWN MORNING ACTIVITY FROM CORDON COUNT (1967)

<u>TIME</u>		<u>INBOUND TRAFFIC</u>			<u>OUTBOUND TRAFFIC</u>			<u>ACCUMULATED TRAFFIC</u>		
<u>FROM</u>	<u>TO</u>	<u>TRANSIT</u>	<u>VEH.</u>	<u>TOTAL</u>	<u>TRANSIT</u>	<u>VEH.</u>	<u>TOTAL</u>	<u>TRANSIT</u>	<u>VEH.</u>	<u>TOTAL</u>
7.00	7.15	856	1961	2817	329	1018	1347	527	943	1470
7.15	7.30	1325	2889	4214	600	1824	2424	725	1065	1790
7.30	7.45	2083	4991	7074	816	2322	3138	1267	2669	3936
7.45	8.00	2002	5618	7620	581	2450	3031	1421	3168	4589
8.00	8.15	2913	5133	8046	842	2551	3393	2071	2582	4653
8.15	8.30	1976	4133	6109	830	2266	3096	1146	1867	3013
8.30	8.45	1539	2837	4376	639	1957	2596	900	880	1780
8.45	9.00	1432	2945	4377	293	2040	2333	1139	905	2044
9.00	9.15	607	2688	3295	324	1709	2033	283	979	1262
9.15	9.30	674	2203	2877	197	1567	1764	477	636	1113
TOTAL		15407	35398	50805	5451	19704	25155	9956	15694	25650

(Chapter V, Page 52).

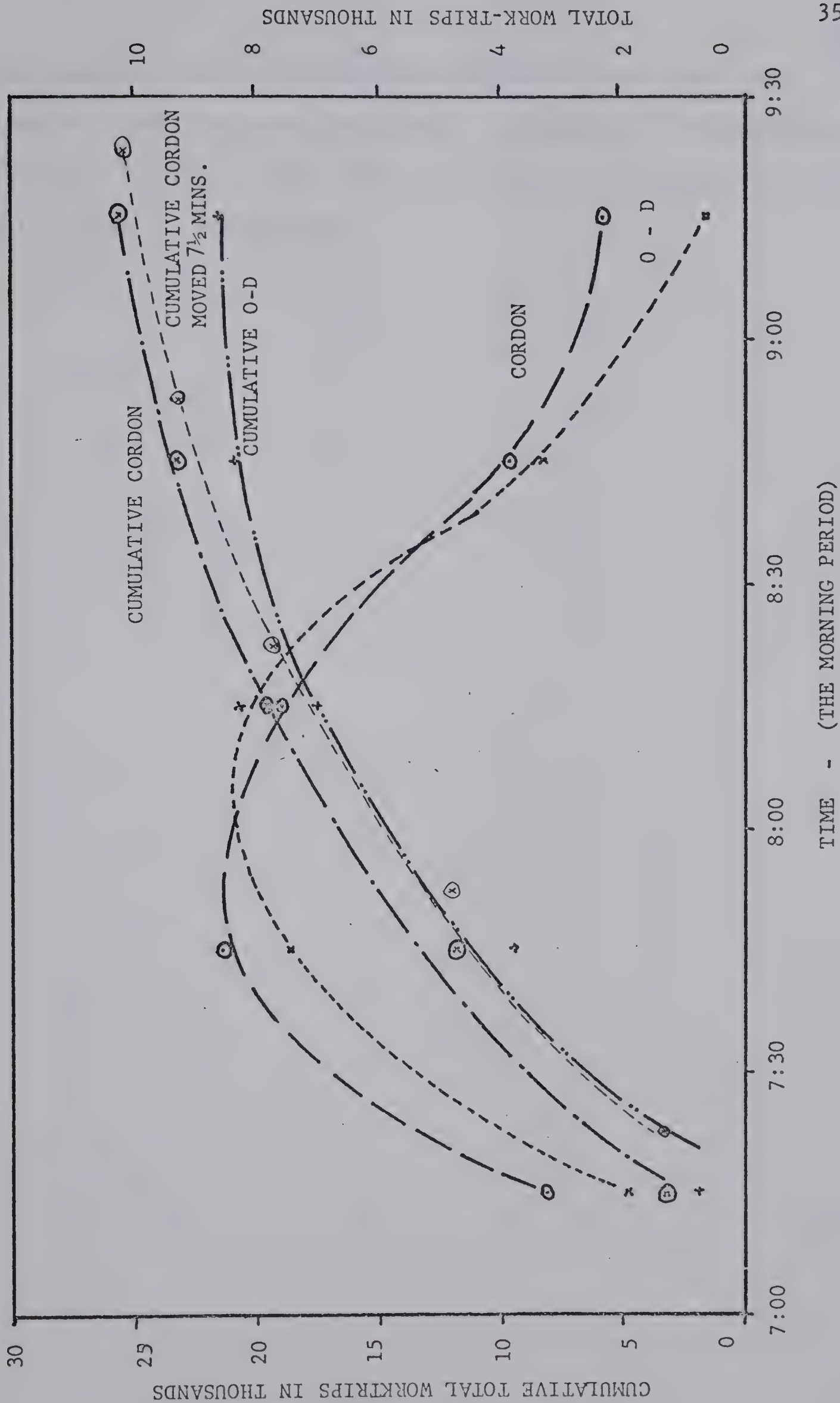
Estimation of the average time difference between the actual arrival time in the CBD and the starting time of work was quite easily and realistically obtained by shifting the time axis of cumulative 'cordon' curve to fit the cumulative O - D curve. This method of mechanical adjustment by shifting of the axis to fit the curves is clearly shown by curves of total worktrips in Figure IV - 4.

The mode split (transit versus total trips) of the O - D and the 'cordoned' value was calculated to check for differences. As before they were first broken down into the number of trips made during each time interval and calculated for the modal split.

The auto-occupancy (total auto-trips versus auto-drivers) of the O - D were calculated with extreme care and much reservation. It was done on the basis that all auto passengers working in the CBD obtained rides from the auto-drivers working in the same region. Although the author realises that this assumption has a fallacy that may render the results quite inaccurate and unrealistic, this step was executed as part of the derivation of a multiplier to bring a calculated figure more in line with those of the actual travel conditions. This was achieved by comparing the calculated occupancy with that of the actual field condition information.

The constituents of the downtown employment were analysed in terms of male and female participation. It was not the intention of this study to go into any great depth in this topic and therefore any

FIGURE. IV-4 COMPARISON OF CORDON COUNT AND THE ORIGIN-DESTINATION SURVEY OF 1967
OF TOTAL PASSENGER-WORKTRIPS



travel behaviour study of the male and the female workers was just confined to simply 'skimming the surface'. A summary of the employment constituent is given in Table IV-5. Detail information concerning this aspect is given in the Appendix E.

TABLE IV - 5

SUMMARY OF 1967 O - D SURVEY

TIME		AUTO DRIVERS			AUTO PASS.			AUTO TRIPS			TRANSIT TRIPS			SUB			MODE		OTHER MODES			
FROM	TO	M	F	TOT	M	F	TOT	TOT	OCC.	M	F	TOT	TOT	TOTAL	SPLIT	M	F	TOT	GRAND	CUMUL.		
7.00	7.30	1021	65	1086	62	137	199	1285	1.184	335	311	646	1931	0.334	90	38	128	2059	2059			
7.30	8.00	3906	298	4204	336	636	972	5176	1.231	1121	1151	2272	7448	0.305	264	214	478	7926	9985			
8.00	8.30	3869	531	4400	294	1040	1334	5374	1.303	741	1790	2531	8265	0.306	286	495	781	9046	19031			
8.30	9.00	1261	245	1506	48	256	304	1810	1.201	298	1177	1475	3285	0.449	88	151	239	3524	22555			
9.00	9.30	127	38	165	5	65	70	235	1.424	52	321	373	608	0.613	17	38	55	663	23218			
TOTAL		10184	1177	11361	745	2134	2879	14240	1.253	2547	4750	7297	21537	0.338	745	936	1681	23218	-			
THE REST		2092	228	2320	94	161	255	2575	1.109	760	1012	1772	4347	0.407	251	130	381	4728	27946			
OVERALL TOTAL		12276	1405	13681	839	2295	3134	16815	1.229	3307	5762	9069	25884	0.350	996	1066	2062	27946	-			

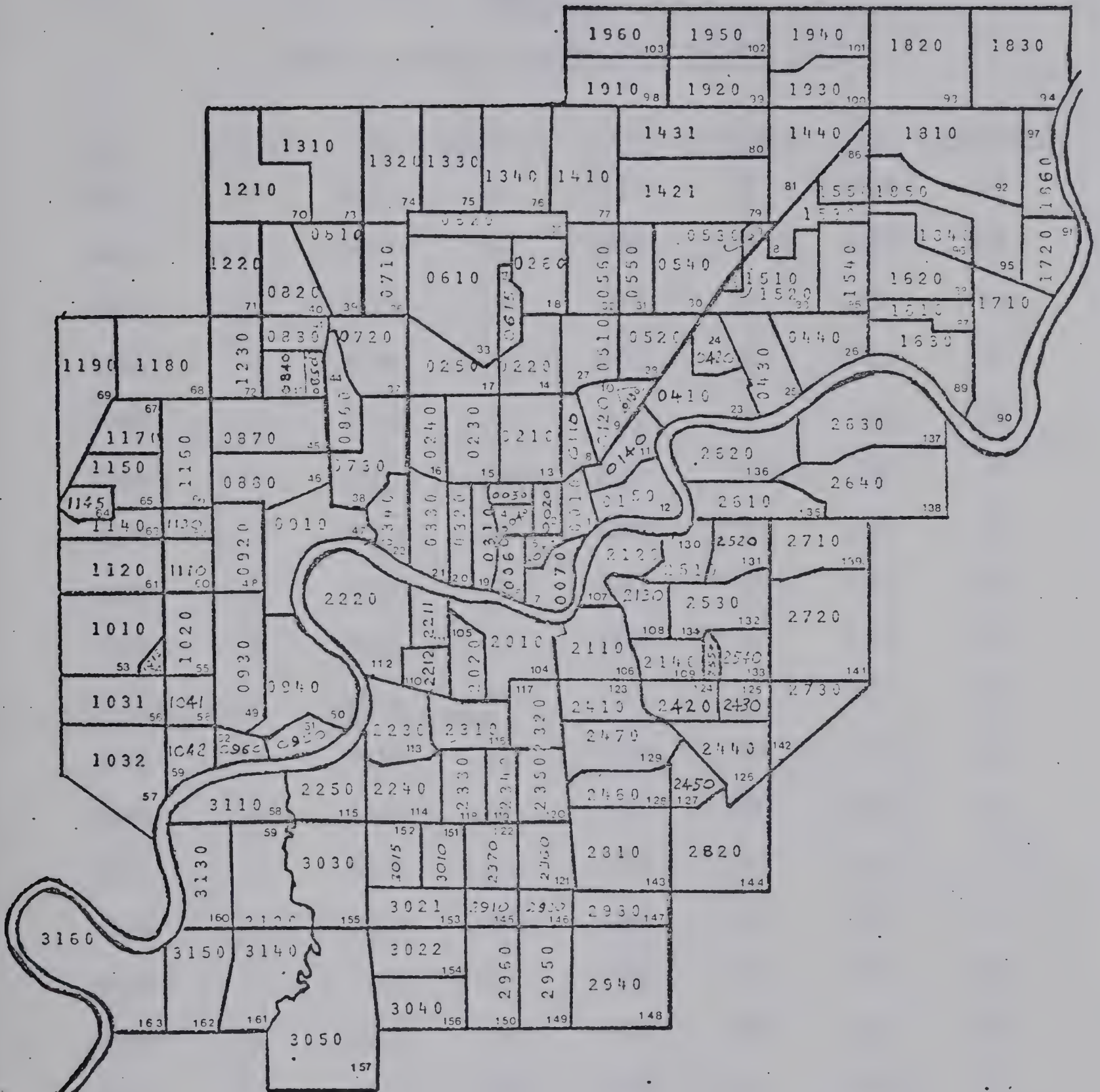
% OTHER MODES/TOTAL = 7.38%

ZONING OF THE CITY

The numbering of the traffic zones for the purpose of analysis is in conformance with the method used in the Metropolitan Edmonton Transportation Study (METS) and the Civic Census. Also the system of assigning centroid numbers to the centre of gravity of each zone was as that used by the Traffic Department. Although attempts were made to readjust the assigned centroid and zone numbers, it was later decided that in order to facilitate future traffic analysis comparison, the system of numbering should be kept constant. Figure IV-5 and Table IV-6 shows the zoning of the city and their respective centroid number equivalence.

DECODING OF THE STREET NETWORK

A considerable amount of time was spent in the decoding of the street network for auto-trips of the entire city to a form suitable for use in the minimum time trip assignment programme. The street network of the city is shown in Figure IV-6. All nodes were assigned even numbers wherever possible. Numbers 1 to 299 were reserved for zone centroids and the numbering of travel node interchanges were started at 300. Although in this investigation, the actual number of centroids tested was 163, provisions were made to allow for additional centroid and node inclusion to the network as may be required. In this way, alternative or future network analysis of the city can be performed by simply supplying additional information to the existing decoding and thereby eliminate the process of having to decode for the whole system



TRAFFIC ZONES AND THEIR RESPECTIVE CENTRIOD
EQUIVALENT

FIGURE IV - 5

TABLE IV - 6

ZONE - CENTROID EQUIVALENCE (NORTH SIDE)

<u>Zone</u>	<u>Centroid</u>	<u>Zone</u>	<u>Centroid</u>	<u>Zone</u>	<u>Centroid</u>	<u>Zone</u>	<u>Centroid</u>
0010	1	0410	23	0870	45	1170	67
0020	2	0420	24	0880	46	1180	68
0030	3	0430	25	0910	47	1190	69
0040	4	0440	26	0920	48	1210	70
0050	5	0510	27	0930	49	1220	71
0060	6	0520	28	0940	50	1230	72
0070	7	0530	29	0950	51	1310	73
0110	8	0540	30	0960	52	1320	74
0120	9	0550	31	1010	53	1330	75
0130	10	0560	32	1015	54	1340	76
0140	11	0610	33	1020	55	1410	77
0150	12	0615	34	1031	56	1415	78
0210	13	0620	35	1032	57	1421	79
0220	14	0710	36	1041	58	1431	80
0230	15	0720	37	1042	59	1440	81
0240	16	0730	38	1110	60	1510	82
0250	17	0810	39	1120	61	1520	83
0260	18	0820	40	1130	62	1530	84
0310	19	0830	41	1140	63	1540	85
0320	20	0840	42	1145	64	1550	86
0330	21	0850	43	1150	65	1610	87
0340	22	0860	44	1160	66	1620	88

TABLE IV - 6 (CONT'D) ZONE - CENTROID EQUIVALENCE (NORTH SIDE)

<u>Zone</u>	<u>Centroid</u>	<u>Zone</u>	<u>Centroid</u>	<u>Zone</u>	<u>Centroid</u>	<u>Zone</u>	<u>Centroid</u>
1630	89	1820	93	1860	97	1940	101
1710	90	1830	94	1910	98	1950	102
1720	91	1850	95	1920	99	1960	103
1810	92	1840	96	1930	100		

ZONE - CENTROID EQUIVALENCE (SOUTH SIDE)

<u>Zone</u>	<u>Centroid</u>	<u>Zone</u>	<u>Centroid</u>	<u>Zone</u>	<u>Centroid</u>	<u>Zone</u>	<u>Centroid</u>
2010	104	2340	119	2550	134	2950	149
2020	105	2350	120	2610	135	2960	150
2110	106	2360	121	2620	136	3010	151
2120	107	2370	122	2630	137	3015	152
2130	108	2410	123	2640	138	3021	153
2140	109	2420	124	2710	139	3022	154
2211	110	2430	125	2715	140	3030	155
2212	111	2440	126	2720	141	3040	156
2220	112	2450	127	2730	142	3050	157
2230	113	2460	128	2810	143	3110	158
2240	114	2470	129	2820	144	3120	159
2250	115	2510	130	2910	145	3130	160
2310	116	2520	131	2920	146	3140	161
2320	117	2530	132	2930	147	3150	162
2330	118	2540	133	2940	148	3160	163

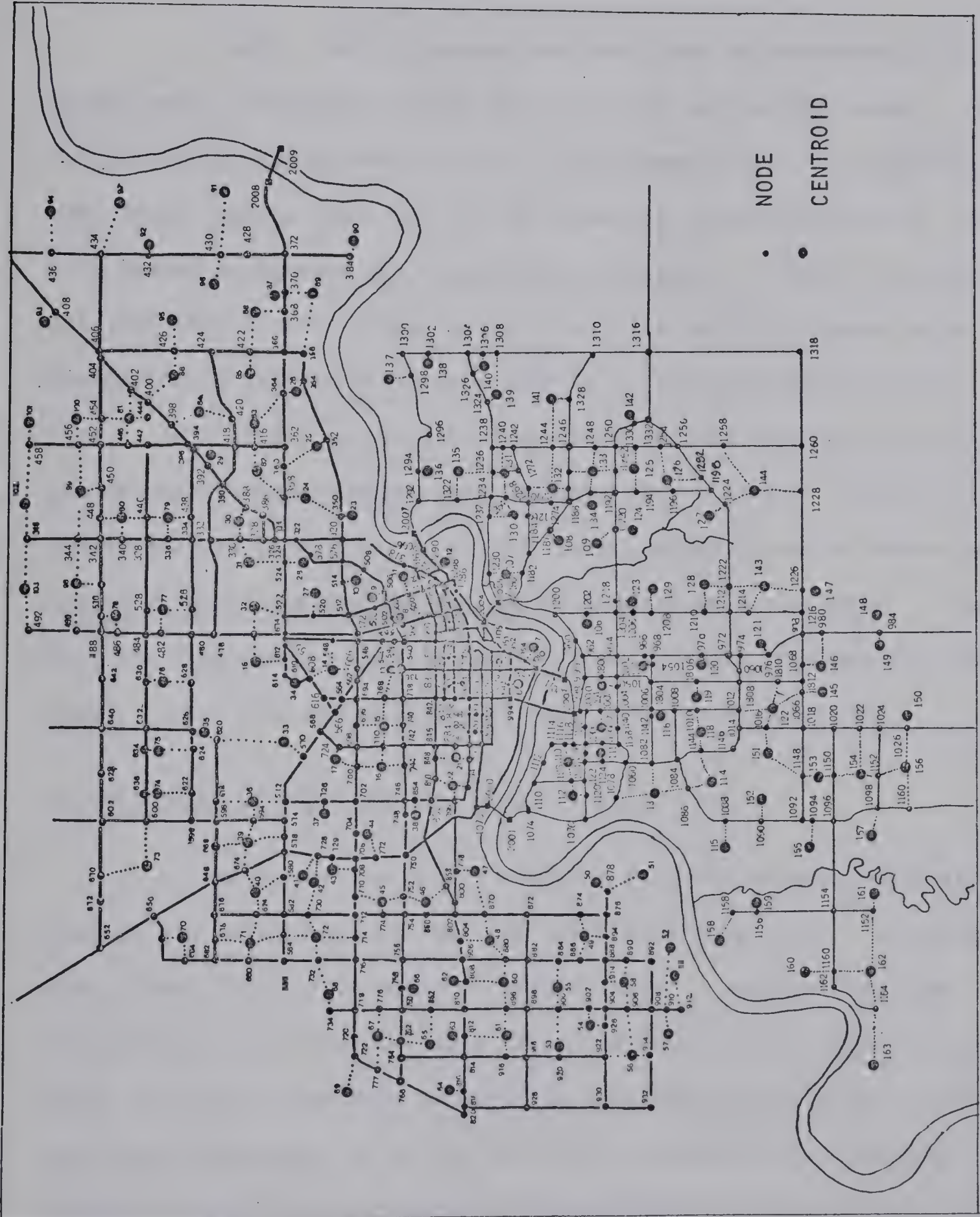


FIGURE IV-6 1966 ARTERIAL STREET NETWORK OF EDMONTON

all over again. Here, the general area location of node numbers is tabulated in Table IV-7.

A very simple programme was developed to rearrange all the origin nodes in ascending order and assign to each a link number. (A listing of this programme is given in the Appendix D). By providing additional 'coding-room' and a link numbering system the risk of double link number assignment was completely eliminated. It should be pointed out that the 'tree-building' and minimum time path programmes to be used have a restriction in which each node is only allowed a maximum of 4 links. As a result an additional checking feature was incorporated in the program to detect nodes that had more than 4 links. Errors in decoding and key-punching were quickly detected and corrected before any erroneous minimum time path assignment results were obtained. In Table F-1, the link numbers, origin and destination nodes together with the speed, travel time and distance of each link can be observed.

Proportioning of Worktrips by Time Intervals

The proportion of all worktrip arrivals at each destination zone of the entire city in 1967 was calculated from the O - D information. Next, the total number of auto-drivers originating from a zone and working in another were extracted from the same data source. Using the zonal proportion of worktrip participation by time of arrival as established above, to be the multiplier to derive the simulated volume of auto-trips originating from each zone and travelling to work in another zone across the river during a specific time period (in this

TABLE IV - 7
GENERAL LOCATION OF NODE NUMBERS
IN THE STREET-NETWORK

<u>From Number</u>	<u>To Number</u>	<u>LOCATION</u>
300	348	Jasper Avenue from 101 St. to 82 St. and north on 82 Street.
350	384	118 Avenue and south to the river (East of 82 St.)
386	436	Fort Road and east (north of 118 Avenue).
438	460	East of 82 St. and north of Fort Road.
462	532	97 Street and east to 82 Street (north of Jasper Ave.)
534	560	101 Street and east to 97 Street (north of Jasper Avenue).
562	592	Kingsway and 118 Avenue West.
594	604	127 Street - (North of 118 Avenue).
606	644	Area between 101 Street and 127 Street (North of Kingsway).
646	666	St. Albert Trail north of 118 Ave. and St. Albert.
668	672	Area between 127 St. and St. Albert Trail.
674	692	Area north of 118 Ave. and west of St. Albert Trail.
694	734	111 Ave. and north of 118 Ave. (west of 101 St.)
736	776	107 Ave. and north to 111 Ave. (west of 101 St.)
778	866	Jasper Ave. - 102 Ave. - Stony Plain Road and north to 107 Ave.
868	944	West end south of Stony Plain Road.

946	988	Bellamy Hill - 105 St. Bridge - Victoria Park Road - 104 St. - Calgary Trail.
990	1030	109 St. - High Level - 109 St. to 61 Ave. - 111 St. to City Limits.
1032	1068	Area between 104 St. and 109 St. (south of Jasper Avenue).
1070	1102	Groat Road - University Avenue - 114 St. - Belgravia Road - 122 St. - 119 St.
1104	1152	Area between 109 Street and Groat Road - 119 St.
1154	1172	Area west of White Mud Creek (south of river).
1174	1198	McDougall Hill - Low Level - Connors Road - 83 St. to Argyll Road.
1200	1228	99 St. and east to 83 Street.
1230	1284	98 Avenue to 75 St., 75 St. south and the area west to 83 Street.
1286	1332	Rowland Road - Dawson Bridge - 106 Ave. - 50 St. and area west to 75 Street.
1334	1350	Highway 16A East of 50 Street and area north of Highway 16.
1352	1372	Highway 14 and area north and east.
1374	1380	34 Street south of Highway 14.
1800	1812	106 St. south of Saskatchewan Drive to north of 51 Avenue.

case, the 30-minute time interval was used). It should be noted that simulation of worktrips was performed only for trips that cross the river, as the main aim of this procedure is to determine the cross-river traffic during the morning period. In Figures IV-7, IV-8 and IV-9 show the sample outputs of calculated proportion of worktrips originating from zone 2010 (centroid 104) and bound for destination zone 0010 (centroid 1).

Assignment of Worktrips

The computer programmes used for 'tree-building' and the minimum time path assignment were the ones that were developed by Dr. J.N. Supersad, Post Doctoral Fellow at the Civil Engineering Department, University of Alberta, 1968, and utilised by Halls in the transit network analysis (Halls, 1968). Except for minor modifications that were made to suit the extent and purpose of this study, the basic overall assignment characteristics were not altered. A listing of the programmes together with the theory of the Moore Algorithm as given by Halls (Halls, 1968) is provided in the Appendix D.

This investigation required the determination of the minimum travel time and distance when travelling from the origin centroid to the destination and also from the points of river crossing to the destination zones. This is accomplished by the usage of the minimum time trip assignment programme mentioned above. From the traffic loadings on the links in the network system the volume of activity on the bridges can be calculated for each time interval. The compilation

FIGURE IV - 7SAMPLE OUTPUT OF WORKTRIP PROPORTIONING PROGRAMMEFOR ZONE 0010

1967 - ORIGIN DESTINATION STUDY OF CITY OF EDMONTON

INVESTIGATION OF THE ZONE-TO-ZONE TIME TRAVEL PATTERN OF THE

MORNING WORKTRIPS

DESTINATION ZONE OF STUDY: 0010 - EQUIVALENT CENTROID NUMBER 1.

TIME OF ARRIVAL	NUMBER OF WORKTRIPS	CUMULATIVE NUMBER	RATIO UP TILL 9:30	CUMUL. RATIO	RATIO OF TOTAL WORKTRIPS	CUMULATIVE RATIO OF WORKTRIPS
7:15	340	340	0.038	0.038	0.030	0.030
7:30	468	808	0.053	0.091	0.041	0.071
7:45	220	1028	0.025	0.116	0.019	0.091
8:00	2904	3932	0.329	0.445	0.256	0.347
8:15	323	4255	0.037	0.481	0.028	0.375
8:30	3016	7271	0.341	0.823	0.266	0.641
8:45	159	7430	0.018	0.841	0.014	0.655
9:00	1186	8616	0.134	0.975	0.105	0.759
9:15	46	8662	0.005	0.980	0.004	0.763
9:30	175	8837	0.020	1.000	0.015	0.779
THE REST	2510	11347			0.221	1.000

FIGURE IV - 8SAMPLE OUTPUT OF MINIMUM PATH TRIP ASSIGNMENTFOR ZONE 2010 TO ZONE 0010

1967 EDMONTON ROAD NETWORK - TRIP PATH

ORIGIN CENT.	DEST. CENT.	NO OF LINKS	TRIP TIME	TRIP LENGTH	---- L I N K ---- NO. TIME DIST.	---- L I N K ---- NO. TIME DIST.
104	1	17	8.3	2.41	722 0.0 0.0	710 0.0 0.0
					690 0.5 0.12	1130 0.6 0.15
					1133 0.6 0.14	1145 0.5 0.16
					9 0.0 0.0	1059 0.0 0.0
					1063 0.5 0.13	1351 0.6 0.14
					1355 0.4 0.10	1359 0.8 0.21
					1861 2.1 0.71	1362 0.0 0.0
					1366 1.0 0.35	1828 0.5 0.16
					215 0.2 0.04	

PROGRAMME COMPLETED

FIGURE IV - 9SAMPLE OUTPUT OF CALCULATED (AUTO-DRIVER) WORKTRIPS PROGRAMMEFOR ORIGIN ZONE 2010 AND DESTINATION ZONE 0010

THE CALCULATED BREAKDOWN OF AUTO WORKTRIPS BY TIME

DESTINATION ZONE 0010 CENTROID NUMBER 1.

ORIGIN ZONE 2010 CENTROID NUMBER 104.

MINIMUM TRIP TIME = 8.3 MINS.

TRIP LENGTH = 2.41 MILES.

TIME OF ARRIVAL	RATIO OF WORKTRIPS	CUMULATIVE RATIO OF WORKTRIPS	NUMBER OF CALCULATED WORKTRIPS	CUMULATIVE NUMBER OF WORKTRIPS
--------------------	-----------------------	-------------------------------------	--------------------------------------	--------------------------------------

7:15	0.030	0.030	0.8	0.8
7:30	0.041	0.071	1.1	1.9
7:45	0.019	0.091	0.5	2.4
8:00	0.256	0.247	7.3	9.7
8:15	0.028	0.375	0.8	10.5
8:30	0.266	0.641	7.5	18.0
8:45	0.014	0.655	0.4	18.4
9:00	0.105	0.759	2.9	21.3
9:15	0.004	0.763	0.1	21.4
9:30	0.019	0.779	0.4	21.8
THE REST	0.221	1.000	6.2	28.0

TOTAL NUMBER OF CALCULATED (PROPORTIONED) WORKTRIPS	28.0
--	------

THE TOTAL NUMBER OF AUTO WORKTRIPS MADE TO ZONE 0010
FROM ZONE 2010 (1967 O - D SURVEY) WAS 28.

nodes and link numbers of the bridges is shown in Figure IV-10. This, when compared with the actual bridge-crossing information obtained from mechanical counters set on the bridges would give an idea of the accuracy of this method of assignment and simulation. As in the previous statistical correlation, the 30-minute interval was used.

The automobile occupancy factor at the points of crossing could be calculated by dividing the auto driver trips with the total auto trips. Auto trips refer to auto drivers and passenger trips. In the same manner, the modal split of the transportation utility on the bridges for worktrips can be derived by the division of the simulated transit trips with the total simulated trips on the bridge-links of the street network system.

In addition the difference of the correlating effects of those from the CBD and the bridge-crossing activities were observed. The latter case was also studied for effects under similar traffic conditions by applying variables that were applicable to the former to a larger area.

FIGURE IV - 10NODES AND LINK NUMBERS AT THE BRIDGES

<u>BRIDGE NAME</u>	<u>LINK NO.</u>	<u>ORIG NODE</u>	<u>DEST NODE</u>	<u>DIRECTION OF TRAVEL</u>
GROAT	1856	2000	2001	SOUTHBOUND
GROAT	1857	2001	2000	NORTHBOUND
HIGH LVL	1361	994	2003	SOUTHBOUND
HIGH LVL	1861	2003	994	NORTHBOUND
105 ST.	1878	2010	2011	SOUTHBOUND
105 ST.	1880	2011	2010	NORTHBOUND
LOW LEVEL	1865	2004	2005	SOUTHBOUND
LOW LEVEL	1868	2005	2004	NORTHBOUND
DAWSON	10	2006	2007	SOUTHBOUND
DAWSON	1871	2007	2006	NORTHBOUND
BEVERLY	1872	2008	2009	SOUTHBOUND
BEVERLY	1875	2009	2008	NORTHBOUND

CHAPTER V

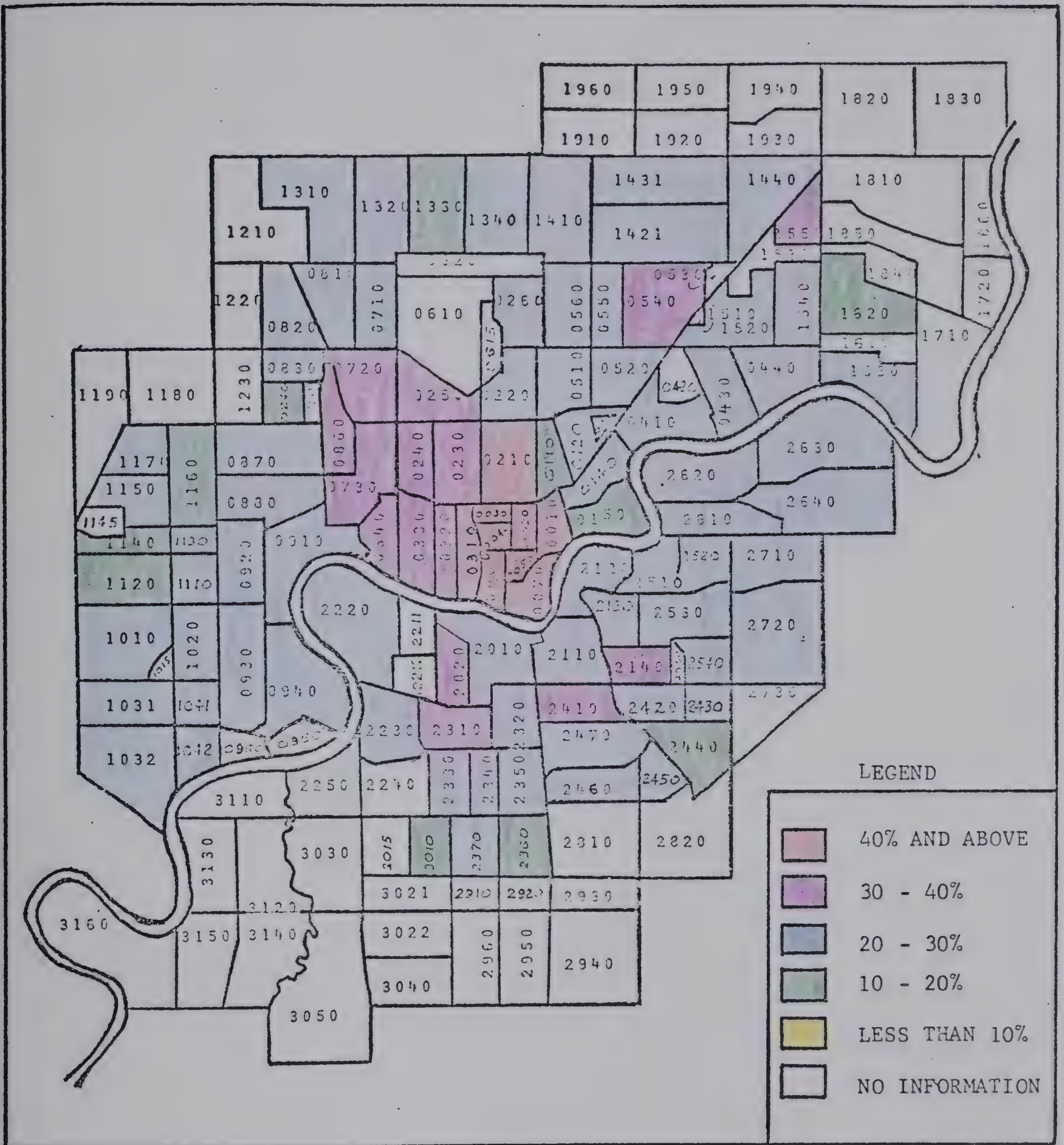
RESULTS AND DISCUSSION

1. Changing Trend between 1961 and 1967.

The population growth rate for the City of Edmonton has been quite consistently maintained at about 14.4% for the periods 1961-1964 and 1964-1967, with the north-side showing a greater growth rate during the latter period by almost 1%. However, both the CBD and the south-side regions have exhibited a slight decline in their rate of growth for the same periods.

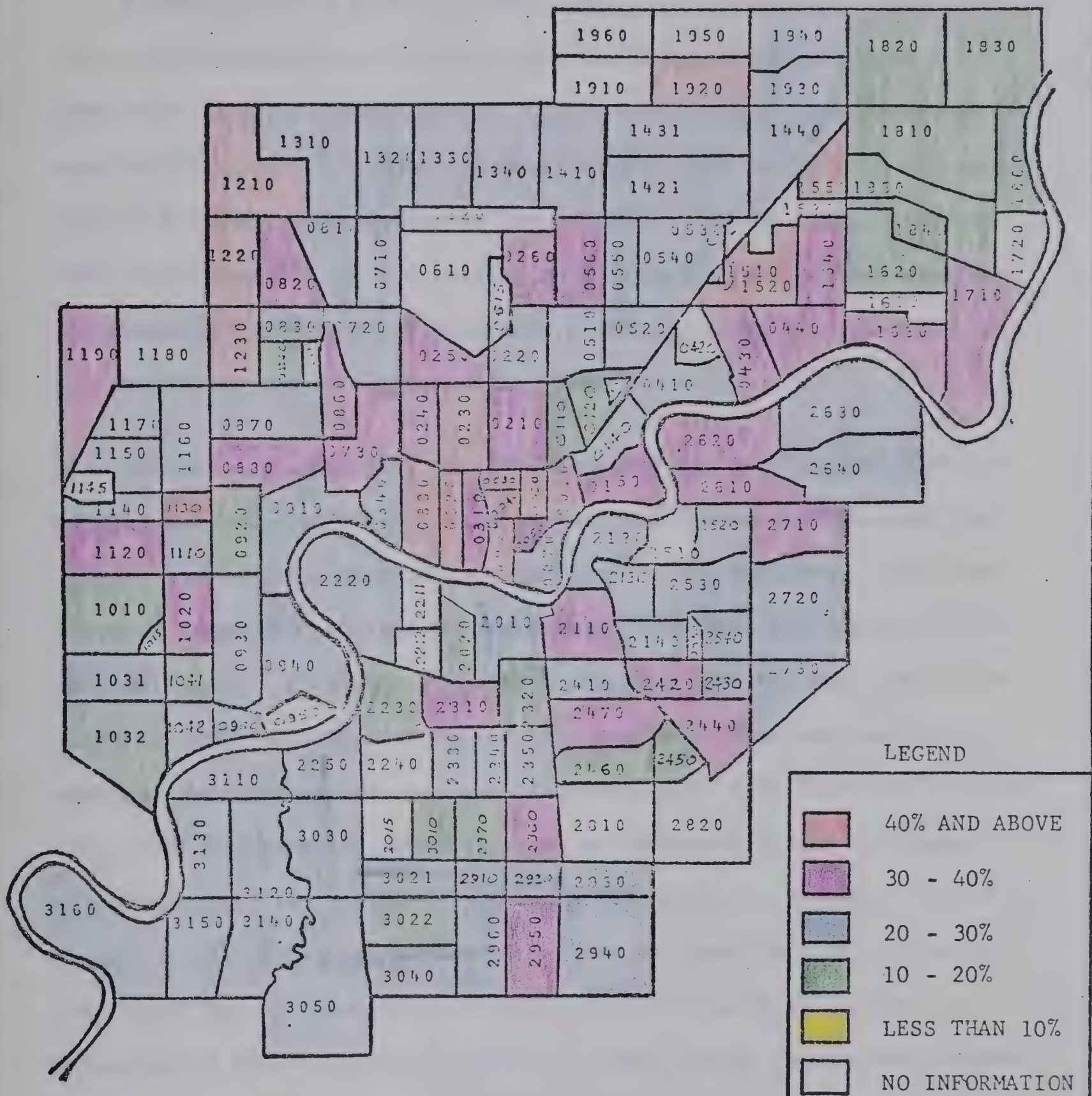
People are generally quite conscious of travelling distances to work and tend to favour locations of residences near points of employment. This is very clearly illustrated for the case of Edmonton in Table V-4 where more than 50% of the CBD-residence employees were employed in the downtown areas (the centre of employment activity in the city). The figures, however show substantial decline of the percentage of total work force working in the CBD (from 34.2% in 1961 to 25.8% in 1967).

The percentages of downtown employees for 1961, 1964 and 1967 by zones are shown in Figures V-1, V-2 and V-3 and Table G - 1.



1961 EMPLOYEE/POPULATION PERCENTAGE BY ZONE

FIGURE. V-1



1967 EMPLOYEE/POPULATION PERCENTAGE BY ZONE

FIGURE. V-3

According to the data available, about 27 out of every 100 persons were gainfully employed during the period 1961 to 1967, with the downtown areas showing a substantially higher proportion. This is to be expected since people (generally from the lower income groups) are conscious of travel costs and would try to reduce them by living close to their locations of work and related activities. Large numbers of rooming houses and single-working people in this area can be used to explain for the higher employment/population ratios.

From as early as 1964, in the Employee O - D survey carried out in conjunction with the Civic Census, Walker and Bakker had observed that "generally the older areas had a reduction of CBD employees, while the outlying areas had substantial increases; indicating a migration of the CBD employees". In figure V-1, the higher employment/population percentages for 1961 were located in and near the CBD. Downtown-residence employees working in the same area amounted to 81.12% (Table V-4). 1964 (Fig. V-2) demonstrated that a pattern of decentralization had been already started for the CBD (as observed by Walker and Bakker). In this figure, zones of highest percentages (greater than 40%) were noticed to have moved out of the central area although they were still situated close to the CBD. A greater scatter of zones having percentages between 30-40% was noted, although the bulk still remained in and around the CBD area. In 1967 (Figure V-3) the prominence of the decentralization from the CBD was definite and showed the "spreading out" effect. Parts of the South-side were exhibiting the same effect.

Among the other signs and effects of the 'spreading out' shown was the ratio of CBD-based employee to the total population which had dropped from 9.10% (1961) to 8.40%(1964) to 6.67% (1967) as can be seen in Table V-4. Population distribution decreased for the North-side by 3% (from 67.97 to 64.97%) although the rate of growth for the South-side had slackened from 20.91 to 18.55% for the periods 1961 - 1964 and 1964 - 1967 respectively.

The comparison of the traffic cordon counts of 1961 (from METS) and 1967 (Table V-5) showed an overall increase of 27.5% for all morning home-to-work traffic with a resulting increase of 37.3% auto-trips and 12.0% transit trips, even though the downtown employment had only increased by 427 workers. As indicated in Table V-2, the decentralization of activities in the CBD created a large proportion of the abovementioned traffic increased which was, in fact, 'through-trips' errors that were being induced. Whereas in 1961, when most employment activities were concentrated in the CBD, the volume of through-traffic didi not pose a problem and the following philosophy was accepted in the 1961 Cordon Count:

Inbound		Outbound		Net CBD
Traffic	-	Traffic	=	Work-trips

TABLE V - 1POPULATION GROWTH(1961 - 1967)

<u>AREA OF RESIDENCE</u>	<u>1961 - 1964</u>		<u>1964 - 1967</u>	
	<u>NO. INCREASE</u>	<u>% INCREASE</u>	<u>NO. INCREASE</u>	<u>% INCREASE</u>
CBD	1,054	17.95	810	11.69
South Side	20,091	20.91	21,555	18.55
North Side	23,354	11.45	28,185	12.40
Overall Area	43,445	14.48	49,460	14.44

TABLE V - 2EMPLOYMENT IN THE CENTRAL
BUSINESS DISTRICT

<u>ZONES</u>	<u>1961</u>	<u>1964</u>	<u>1967</u>
0010	8,340	9,565	11,347
0020	9,640	8,813	7,274
0030	1,200	1,701	1,284
0040	3,200	3,314	3,326
0050	640	590	317
0060	4,090	4,900	4,156
0070	410	302	242
TOTAL	27,520	29,185	27,947

TABLE V - 4

SUMMARY OF EMPLOYMENT SITUATION OF EDMONTON FROM 1961 - 1967

YEAR & AREA OF STUDY	POPULATION			EMPLOYMENT				EMPLOYEE POPULATION OF AREA %
	NO.	% RATIO	NO.	% RATIO	NO.	% RATIO	CBD EMPLOY. TOTAL EMPLOY OF AREA %	
1961								
North Side	203,940	67.97	54,400	68.15	20,157	73.79	37.05	26.67
South Side	96,080	32.03	25,420	31.85	7,159	26.21	28.16	26.45
Overall	300,020	100.0	79,820	100.0	27,316	100.0	34.22	26.60
CBD	5,870		2,410		1,955		81.12	41.05
1964								
North Side	227,294	66.17	61,202	66.98	19,554	67.72	31.94	26.92
South Side	116,171	33.83	30,158	33.02	9,320	32.28	30.90	25.97
Overall	343,465	100.0	91,360	100.0	28,874	100.0	31.60	26.59
CBD	6,924		2,481		1,488		59.97	35.83
1967								
North Side	255,479	64.97	70,930	66.80	18,823	66.70	26.5	27.76
South Side	137,726	35.03	35,254	33.20	9,134	33.30	25.9	25.59
Overall	393,205	100.0	106,184	100.0	27,424	100.0	25.8	27.00
CBD	7,734		2,897		1,545		53.33	37.45

TABLE V - 5
CORDON COUNTS OF 1961 & 1967

<u>TIME</u>		<u>AUTO-TRIPS</u>		<u>TRANSIT TRIPS</u>		<u>TOTAL</u>	
<u>FROM</u>	<u>TO</u>	<u>1961</u>	<u>1967</u>	<u>1961</u>	<u>1967</u>	<u>1961</u>	<u>1967</u>
7:00	7:30	711	2008	792	1252	1503	3260
7:30	8:00	2574	5837	1900	2688	4474	8525
8:00	8:30	2918	4449	2313	3207	5231	7626
8:30	9:00	2388	1785	2561	2039	4949	3824
9:00	9:30	1250	1615	1193	760	2443	2375
TOTAL		9841	15694	8759	9956	18600	25650
% INCREASE			37.29		12.02		27.49

It is generally believed that for a normal day's activity the evening peak movement in an area would be less than the morning's, since the home-bound journey is not as rigid and often voluntarily staggered by some trip-makers who want to avoid the traffic congestion by either starting early to beat it or late to miss it. Another point to be noted is that most home-bound trips have various points of call on the way. From the comparison of peak characteristics exhibited by the 2 cordon counts, it was revealed that the 1961 PM/AM ratios were very much higher than those of 1967 (Table V-6). It should be pointed that the earlier cordon count was conducted on Thursday 5th October 1961. On that day, it was a 'sale-day' for a large departmental store, a pick-up day for charity apple sale and also all the stores in the CBD were opened for late-night shopping. These factors explain the higher evening/morning ratios in 1961 and also the generation of additional evening peak activity during the 'rush-hour'. The $1\frac{1}{2}$ - hour period for both the counts were more compatible although the 1961 PM/AM ratio was still about 10% higher than those of 1967 (Table V-6).

From the 1964 and 1967 O - D survey (Table V-7) it is clearly shown that all the zones in the CBD (with the exception of zones 0010 and 0030) were going through the stage of decentralization as indicated in the above paragraphs. A net reduction of 1239 (4.24%) CBD employees was observed. However, employment situation in zone 0040 (land-use: services) showed no change whereas zone 0010 (offices and city centre) added 18.63% or 1783 workers to its 1964 number. This was because of the opening of new office blocks and centres such as the Canadian

National Towers, Bank of Montreal Building, Royal Bank Building and other urban renewal projects affecting change of land-use and making room for higher employment density.

Although Rhyason (Rhyason, 1967) had to impose 'bridge-penalty' to auto travel time, he did indicate that there were no major CBD street network changes during the period 1961 to 1967. This same pattern was also observed for the following 3 year period. As far as the overall work-trip travel pattern to the downtown area was concerned, as indicated in Figure V-4 and Tables V-8 and V-9, radical changes in travel behaviour was completely absent. In fact the travel trend can be said to be consistent, for instance about 80% of the total employees were at work before 9:00 am and the 'rush' peak hour was 7:30 - 8:30 am. where 58.8% numbering 17154 workers and 60.7% totalling 16972 employees arrived at the CBD for work in 1964 and 1967 respectively.

The CBD transit mode split for 1967 was found to be 35% while Walker and Bakker (Appendix A) observed a 33% split in 1964. To emphasize this increase in mode split there was a reduction of 687 (4.7%) auto-driver worktrips in the O-D of 1967 and the overall driver modal split dropped from 48.7% in 1964 to 45.6% in 1967. From the annual statements of the ETS, the total ridership of buses were observed to have increased substantially (Figure V-5). A comparison of auto-driver trips between the (actual) cordon count and 1967 O - D will indicate that the percentage split is even less. This will be discussed in greater detail in the next section.

TABLE V - 6

COMPARISON OF 1961 & 1967 CORDON COUNT

PEAK TIME OF CONSIDERATION	TIME		1961 CORDON	1967 CORDON	DIFF.	% DIFF.
	FROM	TO				
1 - Hour	7:30	8:30		16191		
	(8:00)	(9:00)	10180		6001	59.04
	5:00	6:00	10646	11647	1001	9.4
			104.57	71.93	16.65	
PM/AM %						
1½ - Hour	7:30	9:00	14654	20015	5361	38.58
	4:30	6:00	12948	15721	2773	21.41
PM/AM %			88.35	78.54	51.72	
2 - Hour	7:00	9:00	16157	23275	7118	44.05
	4:00	6:00	14982	18472	3490	23.29
PM/AM %			92.72	79.36	49.03	

TABLE V - 7

CENTRALIZATION & DECENTRALIZATIONTREND OF EMPLOYMENT IN CBD (1964-1967)

<u>ZONES</u>	<u>TOTAL EMPLOYMENT</u>		<u>DIFFERENCE</u>	
	<u>1964</u>	<u>1967</u>	<u>Vol.</u>	<u>%</u>
0010	9565	11347	+1782	+18.63
0020	8813	7274	-1539	-17.46
0030	1701	1284	- 417	-24.51
0040	3314	3326	+ 12	+ 0.36
0050	590	317	- 273	-46.27
0060	4900	4156	- 744	-15.18
0070	302	242	- 60	-19.86
TOTAL	29185	27946	-1239	- 4.24

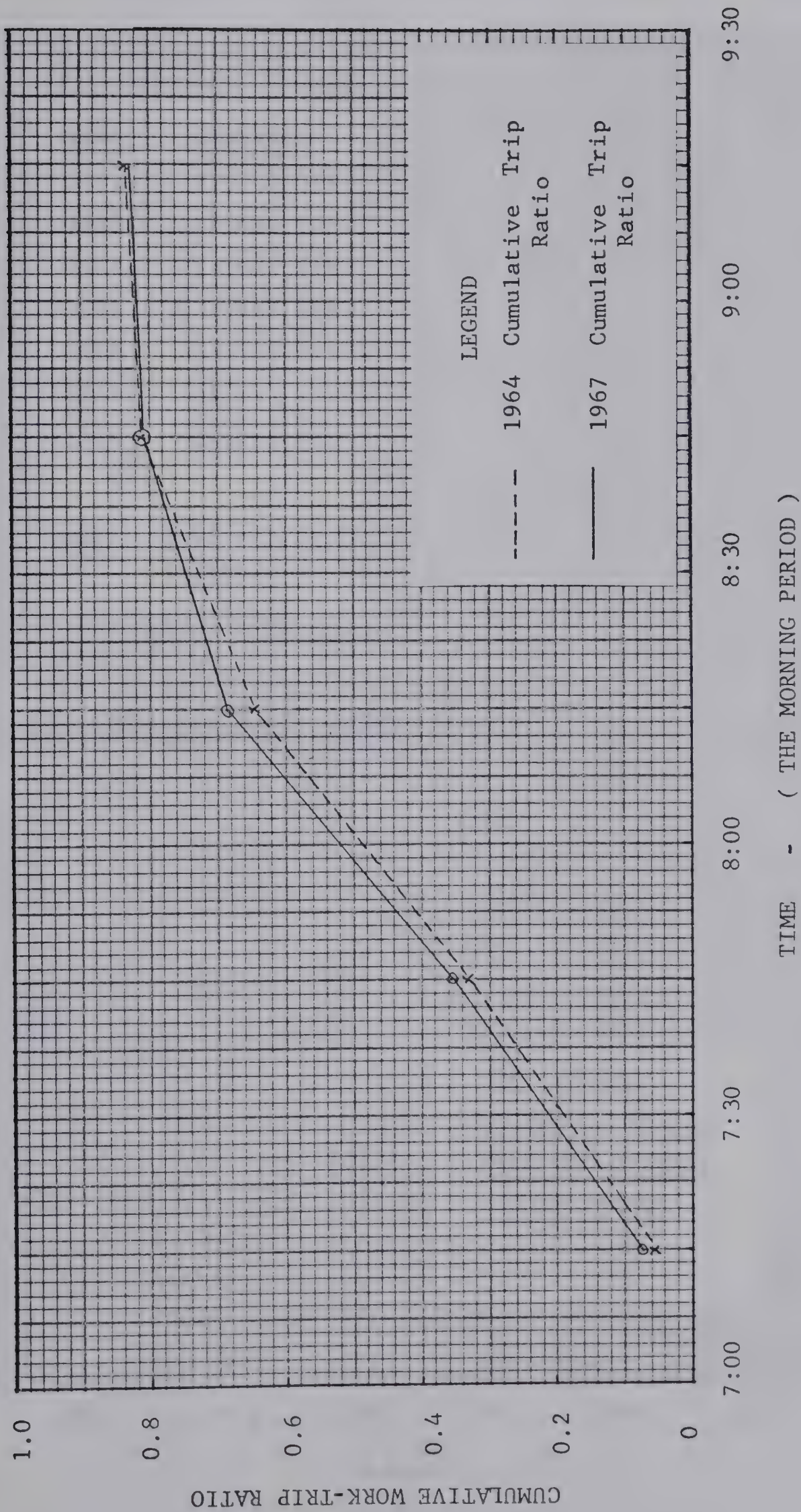


FIGURE. V-4 COMPARISON OF CUMULATIVE WORK-TRIP RATIO IN THE CBD FOR 1964 & 1967.
 (from Origin - Destination Surveys)

FIGURE V - 5

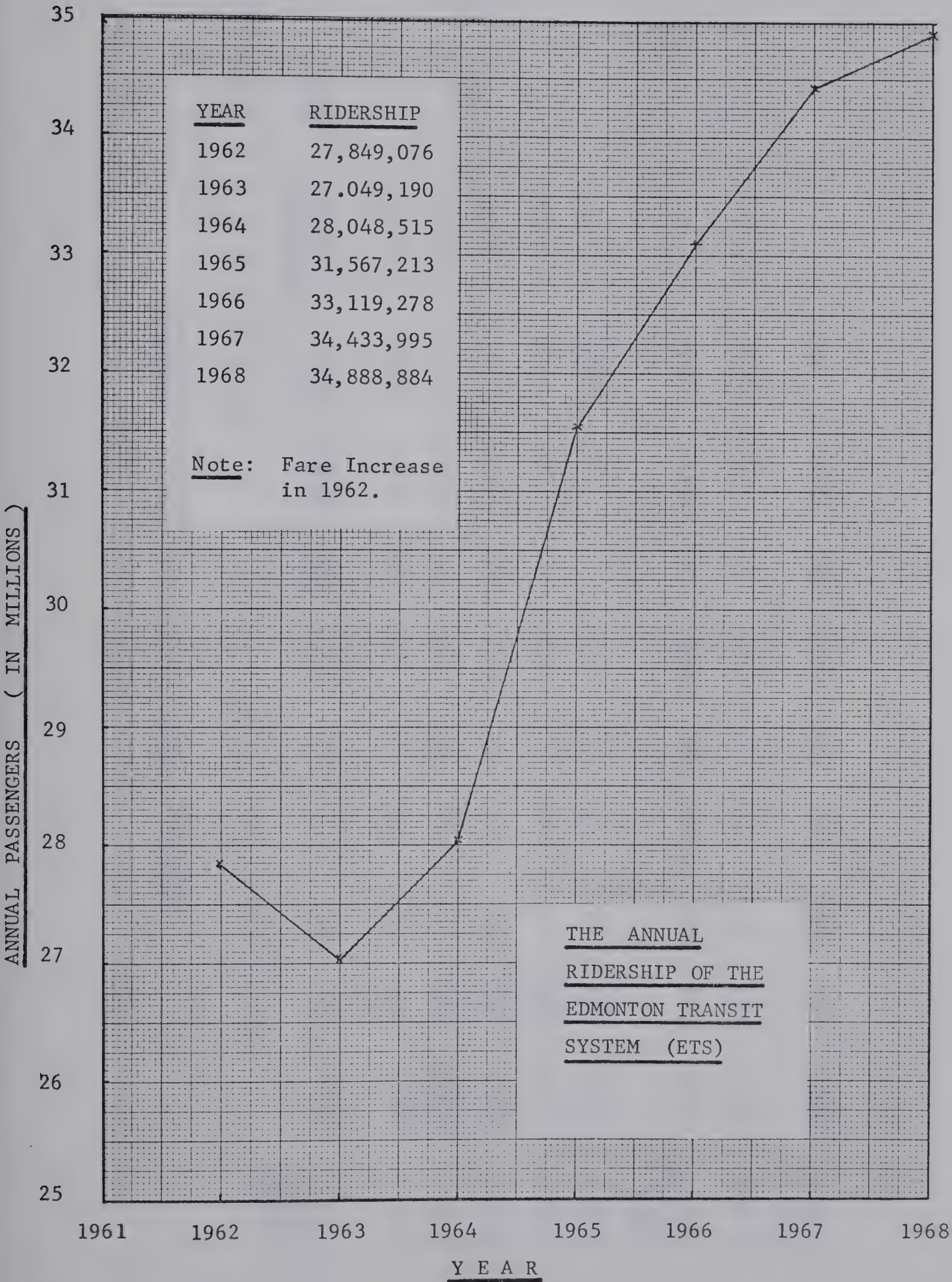


TABLE V - 8

1964 0 - D SURVEY FOR CBD (IN 30 MIN. - INTERVAL)

<u>TIME OF ARRIVAL</u>	<u>D E S T I N A T I O N Z O N E S</u>							<u>T O T A L</u>		<u>P E A K H O U R</u>	
	<u>0010</u>	<u>0020</u>	<u>0030</u>	<u>0040</u>	<u>0050</u>	<u>0060</u>	<u>0070</u>	<u>NUMBER</u>	<u>% RATIO</u>	<u>CUMULATIVE % RATIO</u>	<u>VOLUME</u> <u>%</u>
7:30	561	403	166	250	36	221	30	1667	0.057	0.057	
8:00	2089	2202	706	1088	187	1533	119	7911	0.271	0.328	} 17154 0.588
8:30	2632	2438	450	914	199	2551	60	9243	0.317	0.645	
9:00	1759	2050	108	492	93	261	15	4778	0.164	0.809	
9:30	249	467	21	48	7	19	2	813	0.028	0.837	
TOTAL UP TILL 9:30	7289	7560	1451	2792	522	4572	226	24412	0.837		
OTHERS	2276	1253	250	522	68	328	76	4773	0.163	1.000	
OVERALL TOTAL	9565	8813	1701	3314	590	4900	302	29185	1.000		

TABLE V - 9

1967 O - D SURVEY FOR CBD (IN 30 - MIN. INTERVAL)

TIME OF ARRIVAL	D E S T I N A T I O N Z O N E S							T O T A L			P E A K H O U R	
	0010	0020	0030	0040	0050	0060	0070	VOLUME	% RATIO	CUMULATIVE % RATIO	VOLUME	%
7:30	808	433	150	310	25	296	37	2059	0.073	0.073		
8:00	3124	1945	542	999	82	1123	111	7926	0.284	0.357		
8:30	3339	1968	319	1017	87	2289	27	9046	0.324	0.681	16972	0.607
9:00	1305	1507	46	437	52	131	6	3524	0.126	0.807		
9:30	221	385	2	41	5	9	0	663	0.024	0.831		
TOTAL UP TILL 9:30	8837	6238	1059	2804	251	3848	181	23218	0.831			
OTHERS	2510	1036	225	522	66	308	61	4728	0.169	1.000		
OVERALL TOTAL	11347	7274	1284	3326	317	4156	242	27946	1.000			

2. 1967 Cordon Count and Home Interview Survey of Origin-Destination

The 1967 employment situation was discussed in earlier section and the employee/population percentage by zone is shown in Fig. V-3 for the same year. Table V-10 summarises the O - D information to show the CBD area, the North and South sides' participation in employment activities. The north side contributes 66.7% of the total CBD labour-force and 66.8% of the total overall work strength, whilst the population distribution in the region is 64.97%, thus suggesting that a high proportional degree of employee and population distribution existed for the North side of the City in 1967. On an average, 27 out of 100 persons were employed, of which a little over a fourth of the work strength were concentrated in the downtown area, i.e. 27424 workers or 6.67% of the total population of 393205 persons were attracted by employment in the CBD.

For the CBD residents, 2897 (37.45%) of 7734 were employed, among which 1545 (53.33%) were working in the same area. This constituted about 20 per 100 CBD residents. A more detail tabulation of the 'internal' downtown activities is shown in Table V-11. Zones 0010, 0020 and 0060 employed 36.6%, 25.75% and 20.75% respectively and together claimed 83.1% of the CBD-resident labour.

Figure V-6 and Table V-12 illustrate the 1967's share of CBD employment by the rest of the City. High CBD/Total employee percentage zones were noted to be located in the downtown areas and along the banks on either side of the North Saskatchewan River.

TABLE V - 10

SUMMARY OF 1967 EMPLOYMENT SITUATION (FROM O - D SURVEY)

EMPLOYMENT

AREA OF STUDY	POPULATION		EMPLOYEES		AREA-RESIDENT EMPLOYEE WORKING IN		EMPLOY POPULATION		CBD EMPLOY POPULATION		CBD EMPLOY TOTAL EMPLOY	
	NO.	%	NO.	% DISTRI-BUTION	NO.	% DISTRI-BUTION		%		%		%
North Side	255479	64.97	70930	66.80	18823	66.70	27.76	7.37	26.5			
South Side	137726	35.03	35254	33.20	9134	33.30	25.59	6.63	25.9			
Overall	393205	100.0	106184	100.0	27424	100.0	27.00	6.67	25.8			
CBD	7734		2897		1545		37.45	19.98	53.33			

(not including
Sherwood Pk. &
St. Albert)

TABLE V - 11

1967 CBD WORKTRIPS OF CBD - RESIDENTS

ZONE	POPULATION	EMPLOYMENT	0010	0020	0030	0040	0050	0060	0070	TOTAL CBD-RESID. EMPLOYEE	%
0010	1124	501	149	84	7	25	2	9	1	277	55.3
0020	922	389	70	32	2	31	7	57	1	266	58.1
0030			6	15	-	2	-	3	-		
0040			-	-	-	-	-	-	-		
0050	2983	899	186	159	5	44	15	74	5	488	54.3
0060	1193	694	101	77	6	71	5	153	-	413	59.3
0070	1515	414	54	31	4	9	3	25	15	141	34.3
TOTAL	7724	2897	566	398	24	182	32	321	22	1545	53.3
% DISTRIBUTION			36.6	25.75	1.55	11.78	2.07	20.75	1.42		

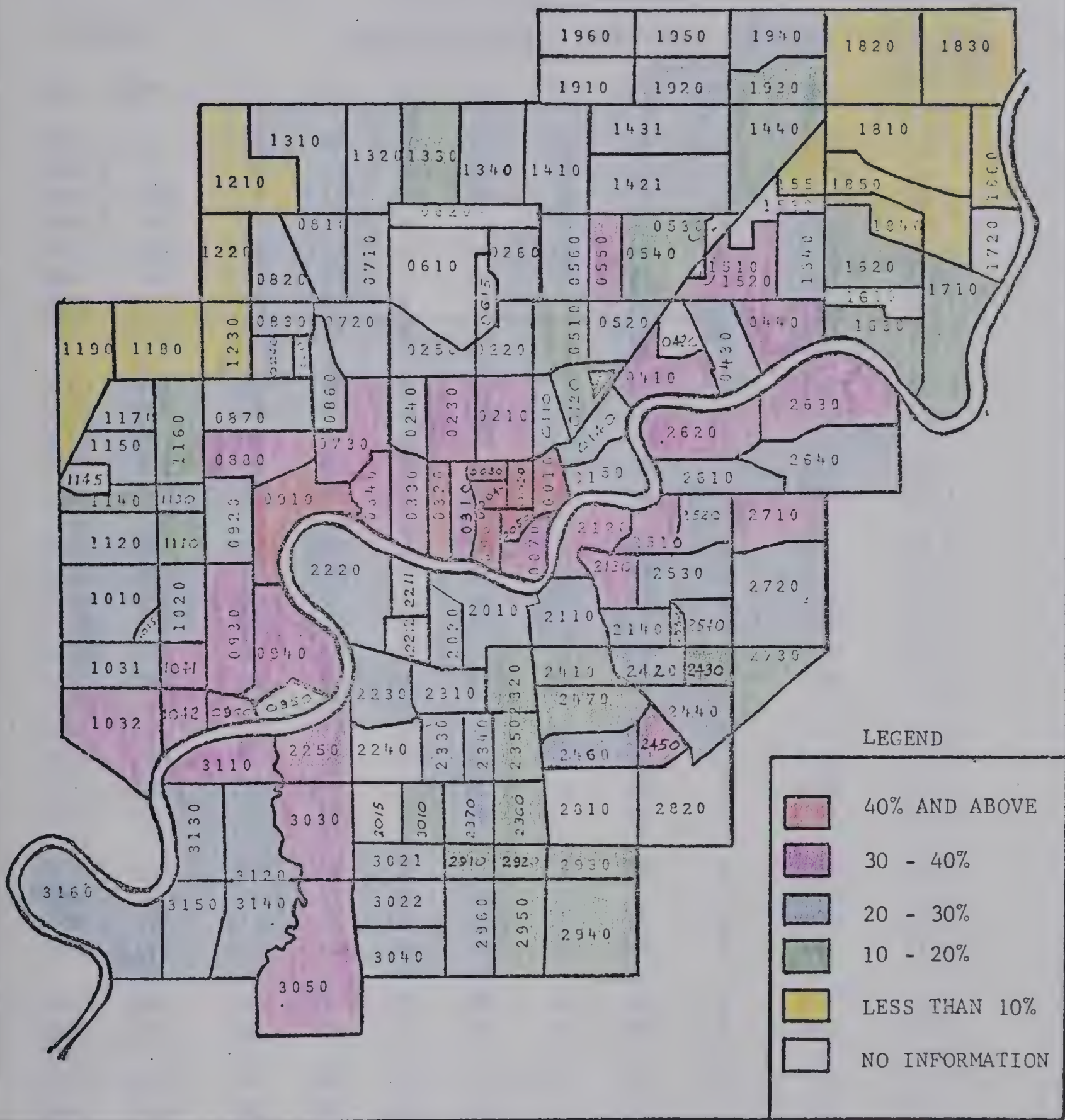


TABLE V - 12

EMPLOYMENT IN CBD (1967)

ORIGIN		DESTINATION ZONES EMPLOYMENT								(CBD/TOTAL EMPLOYEE) %
ZONE	EMPL.	0010	0020	0030	0040	0050	0060	0070	TOTAL	
0010	501	149	84	7	25	2	9	1	277	55.3
0020	389	70	32	2	31	7	57	1	200	58.1
0030		6	15	0	2	0	3	0	26	
0040		-	-	-	-	-	-	-	-	
0050	899	186	159	5	44	15	74	5	488	54.3
0060	694	101	77	6	71	5	153		413	59.5
0070	414	54	31	4	9	3	25	15	141	34.1
CBD	2897	566	398	24	182	32	321	22	1545	53.3
0110	643	66	48	6	14	7	25	1	167	26.0
0120	568	47	19	6	9	0	14	5	110	19.4
0130	-	-	-	-	-	-	-	-	-	-
0140	692	99	41	9	15	4	16	2	186	26.9
0150	879	101	50	15	23	5	34	1	229	26.1
0210	1560	203	134	27	56	4	53	4	481	30.8
0220	896	98	36	7	24	6	27	4	202	22.5
0230	1971	292	141	35	79	7	81	2	637	32.3
0240	262	35	15	3	7	3	8	0	71	27.1
0250	731	71	51	8	21	2	25	0	178	24.4
0260	857	74	49	12	17	3	23	1	179	20.9
0310	1040	117	98	13	72	12	55	0	367	35.3
0320	1069	155	113	16	80	8	73	1	446	41.7
0330	1330	170	152	15	72	7	59	0	475	35.7
0340	602	83	65	9	21	3	35	1	217	36.0
0410	592	88	48	8	25	3	22	0	194	32.8
0420	-	-	-	-	-	-	-	-	-	-
0430	966	110	79	14	23	1	30	3	260	26.9
0440	1101	149	96	15	29	6	48	4	347	31.5
0510	1902	151	94	25	29	6	60	3	368	19.3
0520	1527	160	84	17	33	5	48	6	353	23.1
0530	-	-	-	-	-	-	-	-	-	-
0540	1033	74	41	15	17	3	31	3	184	17.8
0550	712	72	39	10	11	2	8	3	145	20.4
0560	1613	160	93	25	37	6	46	6	373	23.1
0610	-	-	-	-	-	-	-	-	-	-
0615	-	-	-	-	-	-	-	-	-	-
0620	-	-	-	-	-	-	-	-	-	-
0710	731	71	32	7	18	5	21	3	157	21.5
0720	1369	147	100	17	55	4	59	5	387	28.3
0730	1509	185	122	20	54	11	59	1	452	30.0

TABLE V-12 (continued) EMPLOYMENT IN CBD (1967)

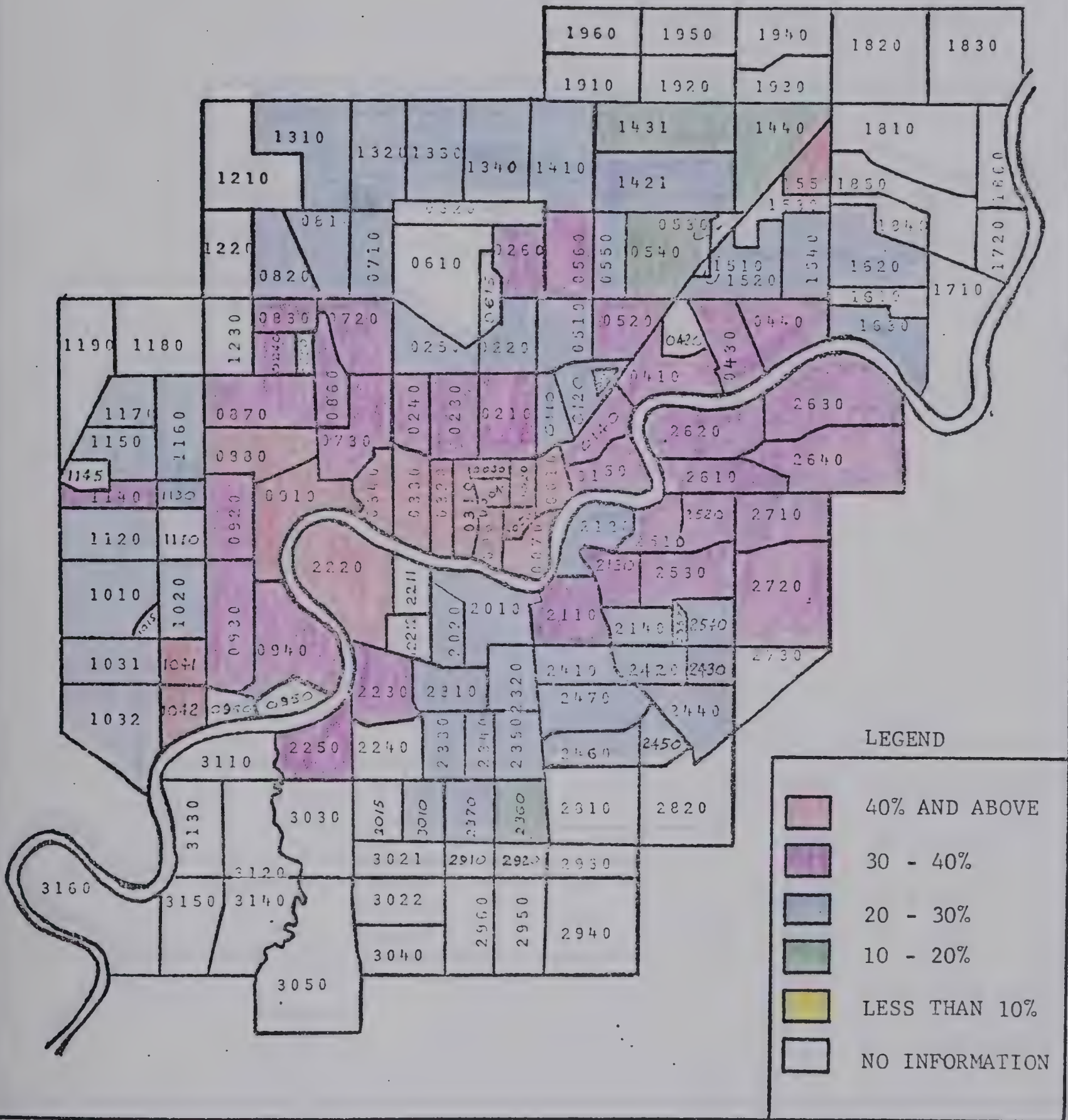
ZONE EMPL.		DESTINATION ZONES EMPLOYMENT							TOTAL	(CBD/TOTAL EMPLOYEE) %
		0010	0020	0030	0040	0050	0060	0070		
0810	1160	122	81	13	35	1	30	5	287	24.7
0820	1248	121	78	22	28	0	41	2	292	23.4
0830	721	84	43	12	23	1	20	5	188	26.1
0840	77	10	6	0	2	0	5	0	23	29.9
0850	-	-	-	-	-	-	-	-	-	-
0860	1563	142	117	8	43	1	53	1	365	23.4
0870	1436	149	102	24	39	1	58	-	373	26.0
0880	1584	191	150	16	54	4	61	3	479	30.2
0910	533	97	81	9	31	0	25	0	243	45.6
0920	419	45	36	6	13	2	14	0	116	27.7
0930	1629	204	150	27	77	6	69	0	533	32.7
0940	783	111	98	10	50	1	23	0	293	37.4
0950	-	-	-	-	-	-	-	-	-	-
0960	176	22	16	2	11	0	9	0	60	34.1
1010	1378	124	103	24	39	2	62	0	354	25.7
1015	-	-	-	-	-	-	-	-	-	-
1020	1260	25	72	23	40	3	39	2	274	21.7
1031	1438	149	84	17	48	0	43	1	324	23.8
1032	139	18	17	2	10	0	5	0	52	37.4
1041	282	35	31	0	13	1	17	0	97	34.4
1042	251	33	28	5	10	0	16	0	92	36.7
1110	629	32	16	12	12	1	10	0	83	13.2
1120	944	77	40	15	28	2	35	3	200	21.2
1130	785	64	43	16	20	2	17	0	162	20.6
1140	200	16	5	2	4	0	9	0	36	18.0
1145	-	-	-	-	-	-	-	-	-	-
1150	858	70	41	12	26	4	27	2	182	21.2
1160	1327	74	76	23	40	3	33	2	251	18.9
1170	1107	90	60	12	30	2	24	3	221	20.0
1180	80	1	0	1	2	0	2	0	6	7.5
1190	78	3	1	0	1	0	1	0	6	7.7
1210	33	0	1	0	1	0	1	0	3	9.1
1220		-	-	-	-	-	-	-	-	-
1230		-	-	-	-	-	-	-	-	-
1310	1998	213	128	20	53	3	61	5	483	24.2
1320	1304	105	72	19	34	5	31	4	269	20.6
1330	1304	119	57	10	23	3	33	2	247	18.9
1340	2025	182	125	27	48	7	50	7	446	22.0

TABLE V-12 (continued) EMPLOYMENT IN CBD (1967)

<u>ZONE EMPL.</u>		<u>DESTINATION ZONES EMPLOYMENT</u>								<u>(CBD/TOTAL EMPLOYEE) %</u>
		<u>0010</u>	<u>0020</u>	<u>0030</u>	<u>0040</u>	<u>0050</u>	<u>0060</u>	<u>0070</u>	<u>TOTAL</u>	
2010	1066	91	59	10	26	1	31	1	219	20.5
2020	698	58	48	7	29	7	19	0	168	24.1
2110	1969	157	119	20	51	5	46	6	404	20.5
2120	335	35	22	7	14	0	30	4	112	33.5
2130	709	100	61	9	26	0	33	2	231	32.6
2140	469	40	20	4	8	1	60	2	135	28.8
2211	-	-	-	-	-	-	-	-	-	-
2212	-	-	-	-	-	-	-	-	-	-
2220	392	55	28	5	21	0	0	0	109	27.8
2230	760	66	43	2	29	1	29	2	172	22.6
2240	-	-	-	-	-	-	-	-	-	-
2250	351	44	34	0	14	2	14	0	108	30.8
2310	1321	113	77	12	23	5	43	3	276	20.9
2320	414	31	17	3	8	0	9	0	68	16.4
2330	1007	107	63	8	21	3	43	4	249	24.7
2340	743	63	39	3	12	0	33	2	152	20.4
2350	358	23	16	2	7	2	5	1	56	15.6
2360	797	46	36	3	20	3	23	3	134	16.8
2370	461	50	20	5	16	3	25	3	122	26.5
2410	747	51	36	5	13	0	17	0	122	16.3
2420	1019	84	55	20	19	3	34	2	217	21.3
2430	649	45	33	5	12	1	17	4	117	18.0
2440	1195	104	69	11	37	4	51	6	282	23.6
2450	153	18	16	1	6	0	7	1	49	32.0
2460	479	40	27	6	10	0	12	6	101	21.1
2470	1681	123	82	11	39	1	40	0	296	17.6
2510	204	28	22	1	10	0	12	1	74	36.3
2520	849	98	63	11	27	0	39	1	239	28.1
2530	1374	162	89	15	35	5	57	6	369	26.9
2540	645	59	34	6	16	1	20	3	139	21.6
2550	-	-	-	-	-	-	-	-	-	-
2610	1154	132	70	14	27	2	40	6	291	25.2
2620	926	153	59	12	35	1	32	2	294	31.7
2630	1472	214	145	17	56	5	60	3	500	34.0
2640	1886	232	101	26	45	4	102	7	517	27.4
2710	1711	214	141	14	69	2	72	4	516	30.2

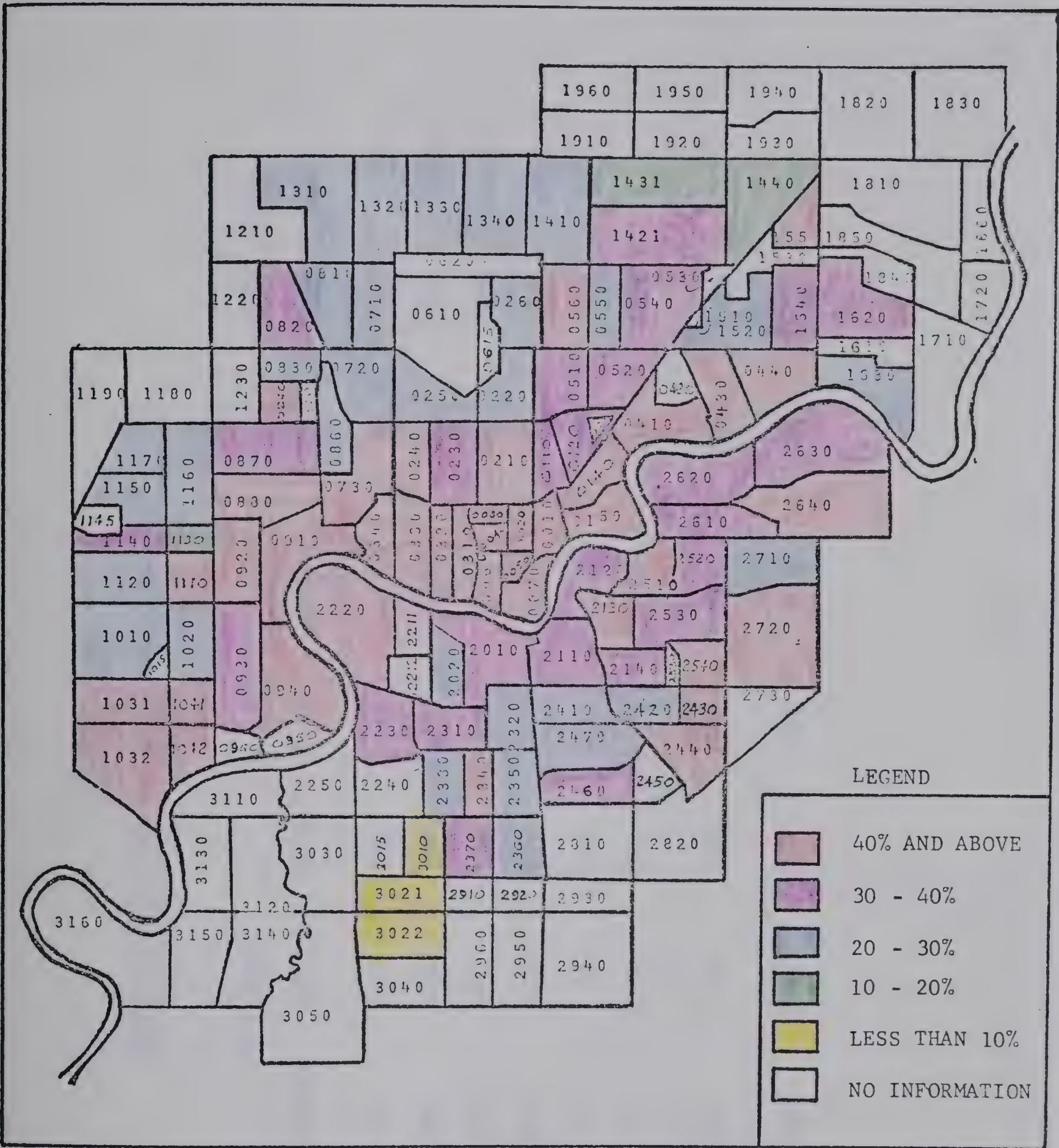
TABLE V-12 (continued) EMPLOYMENT IN CBD (1967)

ZONE EMPL.		DESTINATION ZONES EMPLOYMENT								(CBD/TOTAL EMPLOYEE) %
		0010	0020	0030	0040	0050	0060	0070	TOTAL	
2715	-	-	-	-	-	-	-	-	-	-
2720	3050	330	178	20	81	8	119	4	740	24.3
2730	233	14	5	2	3	0	3	0	27	11.6
2810	-	-	-	-	-	-	-	-	-	-
2820	-	-	-	-	-	-	-	-	-	-
2910	200	13	11	1	5	3	6	0	39	19.5
2920	145	8	6	0	5	0	0	0	19	13.1
2930	66	3	2	1	2	0	3	0	11	16.7
2940	-	-	-	-	-	-	-	-	-	-
2950	84	5	1	0	3	1	3	1	14	16.7
2960	56	9	4	0	0	0	2	0	15	26.8
2010	574	44	28	5	6	2	27	1	113	19.7
3015	-	-	-	-	-	-	-	-	-	-
3021	805	82	45	7	27	2	62	0	225	28.0
3022	480	54	28	5	16	0	16	1	120	25.0
3030	215	34	22	0	4	0	9	0	69	32.1
3040	721	80	38	12	32	2	49	0	213	29.5
3050	607	60	60	8	31	4	30	0	193	31.8
3110	24	1	4	0	0	0	0	0	5	20.8
3120										
3130										
3140										
3150										
3160										
TOTAL	106184	11155	7095	1258	3269	327	4063	236	27424	25.8
OTHERS		192	179	27	59	2	93	3		
OVERALL TOTAL		11347	7274	1285	3326	329	4156	239		



1964 CBD/TOTAL EMPLOYEE PERCENTAGE BY ZONE

FIGURE. V-7



1961 CBD/TOTAL EMPLOYEE PERCENTAGE BY ZONE

FIGURE. V-8

TABLE V - 13

TRAVEL BEHAVIOUR OF THE FEMALE WORKERS (1967 0 - D)
IN CBD

<u>TIME</u>		<u>AUTO TRIPS</u>		<u>TRANSIT</u>		<u>OTHER MODES</u>		<u>TOTAL TRIPS</u>	
<u>FROM</u>	<u>TO</u>	<u>DRIVERS</u>	<u>PASS.</u>	<u>TOTAL</u>	<u>PASS.</u>	<u>AUTO + TRANSIT</u>		<u>GRAND</u>	<u>ACC.</u>
7.00	7.30	65	137	202	311	513	38	551	551
7.30	8.00	298	636	934	1151	2085	214	2299	2850
8.00	8.30	531	1040	1571	1790	3361	495	3856	6706
8.30	9.00	245	256	501	1177	1678	151	1829	8535
9.00	9.30	38	65	103	321	424	38	462	8997
TOTAL		1177	2134	3311	4750	7061	936	8997	-
OTHERS		228	161	389	1012	1401	130	1531	10528
OVERALL TOTAL		1405	2295	3700	5762	9462	1066	10528	-

TABLE V - 14

TRAVEL BEHAVIOUR OF THE MALE WORKERS (1967 0 - D)

IN CBD									
<u>TIME</u>		<u>AUTO TRIPS</u>		<u>TRANSIT</u>		<u>OTHER</u>		<u>TOTAL TRIPS</u>	
<u>FROM</u>	<u>TO</u>	<u>DRIVERS</u>	<u>PASS.</u>	<u>TOTAL</u>	<u>PASS.</u>	<u>AUTO + TRANSIT</u>	<u>MODES</u>	<u>GRAND</u>	<u>ACC.</u>
7.00	7.30	1021	62	1083	335	1428	90	1508	1508
7.30	8.00	3906	336	4242	1121	5363	264	5627	7135
8.00	8.30	3869	294	4163	741	4904	286	5190	12325
8.30	9.00	1261	48	1309	298	1607	88	1695	14020
9.00	9.30	127	5	132	52	184	17	201	14221
TOTAL		10184	745	10929	2547	13476	745	14222	-
OTHERS		2092	94	2186	760	2946	251	3197	17418
OVERALL TOTAL		12276	839	13115	3307	16422	996	17418	-

TABLE V - 15

84

COMPARISON OF THE ORIGIN-DESTINATION DATAWITH THE CORDON COUNT OF 1967

<u>TYPE OF</u> <u>WORKTRIPS</u>	<u>TIME</u>		<u>CORDON COUNT</u>			<u>O - D</u> <u>SURVEY</u>	<u>DIFFERENCE</u>	
	<u>FROM</u>	<u>TO</u>	<u>IN</u>	<u>OUT</u>	<u>NET</u>		<u>TRIPS</u>	<u>%</u>
TRANSIT	7:00	7:30	2181	929	1252	646	606	48.4
	7:30	8:00	4085	1397	2688	2272	416	15.5
	8:00	8:30	4889	1672	3207	2531	686	21.4
	8:30	9:00	2971	932	2039	1475	554	27.1
	9:00	9:30	1281	521	760	373	387	49.6
	TOTAL		15407	5451	9956	7297	2659	26.7
AUTO DRIVERS	7:00	7:30	3341	2252	1159	1086	73	6.3
	7:30	8:00	7241	3917	3324	4204	- 880	- 26.5
	8:00	8:30	6600	3748	2852	4400	- 1548	- 54.3
	8:30	9:00	4845	3152	1693	1506	- 187	- 11.0
	9:00	9:30	3719	2748	971	165	806	83.0
	TOTAL		25816	15817	9999	11361	- 1362	- 13.6
AUTO PASSENGERS	7:00	7:30	1439	590	849	199	650	76.6
	7:30	8:00	3368	855	2513	972	1541	61.3
	8:00	8:30	2666	1069	1597	1334	263	16.5
	8:30	9:00	937	845	92	304	- 212	-230.4
	9:00	9:30	1172	528	644	70	574	89.1
	TOTAL		9582	3887	5695	2879	2816	49.4

In the O-D survey, employees of both sexes were interviewed. Tables V-13 and V-14 show the characteristics of travel for both sexes. While 62.3% of the total CBD employees were male; 80.49% of them arrived at work before 9:00 am (62.1% during the peak-hour). For the female employees, 58.46% arrived at the peak-hour and 81.07% before 9:00am. It should be noted that the bus mode split for female workers was 0.55 while the males only registered 0.19. The ratio of auto drivers were 8.74 to 1 for the male and female work-trips respectively. This is to be expected since the female income is generally lower.

The comparison of work-trip information from the cordon count and the O-D survey are shown in Table V-15 where they were broken into the various comparable modes of transportation. The differences between the cordon inbound and the outbound volumes of transit, auto-driver and auto-passenger trips were assumed to be the actual volume of work-trips in the CBD. This meant that all work-trips made within the surveyed area and those which involved other modes of transportation, such as walking, were not accounted for. It should be pointed out that the CBD employees who walked to work (the 'other' major mode of transportation) generally live close to their places of employment (due to the control of the economic, climatic and environmental conditions). The Origin-Destination survey indicated that while 1545 CBD employees live in this area there were 1938 who walked to work. Also there were 1352 CBD-residents who worked out of the cordoned area and were counted as

"through-traffic".

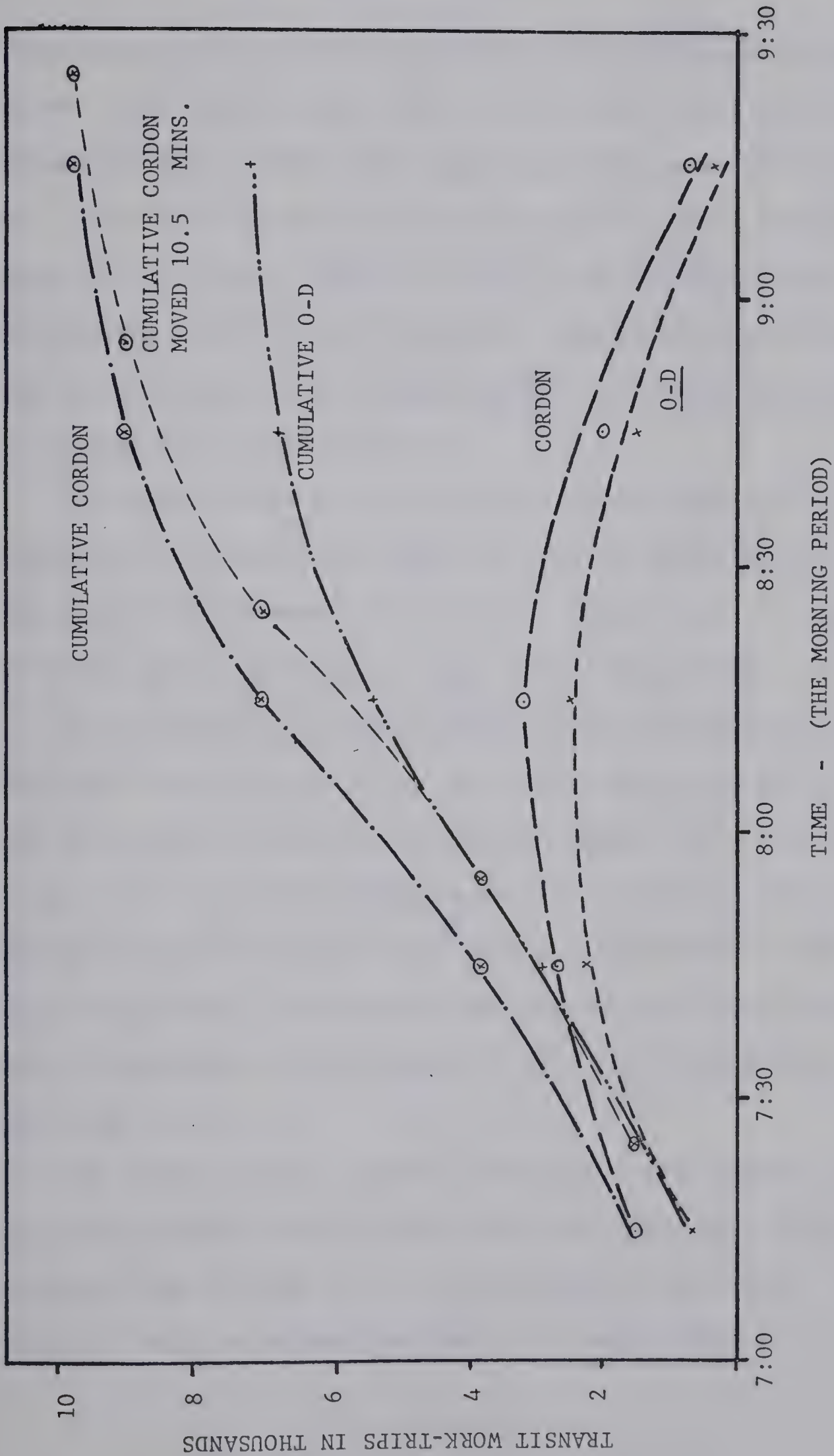
Another factor that could have affected the cordon count's accuracy is 'transient trips'. Through-traffic entering the cordon line at the end of a particular time interval and leaving at the next interval were recorded as CBD-bound traffic arriving during the former time interval. The calculation of overall arrival trips greatly reduced the 'transient' trip errors whose sensitivity depended on the length of time period of measurement.

The comparison of transit trips is shown in Table V-15 and Figure V-9 where the cumulative trips were tabulated and graphically plotted. Here, it will be seen that by moving the time axis of the cumulative cordon curve forward by 10.5 minutes it will have quite similar peak arrival characteristics as those indicated by the cumulative O-D curve. This signifies that on the average the CBD transit worktrips arrive in the downtown area $10\frac{1}{2}$ minutes earlier than their actual starting time of work.

It should be pointed out that transit patrons being usually 'captive' riders do not have much choice in the selection of the time of arrival as it depends very much on the bus schedules. Also a large portion of the $10\frac{1}{2}$ minutes was probably allocated for the last leg of the work-trip for walking from the transportation facility to destination points. If the average walking speed is 3.0 m.p.h., it would mean that the average distance that could be covered during this time would be 0.525 miles (about 5 blocks). This would probably not be the case for most transit riders as the

FIGURE. V - 9 COMPARISON OF CORDON COUNT AND THE ORIGIN-DESTINATION SURVEY OF 1967

OF TRANSIT WORKTRIPS



transit network in the CBD is quite extensive, although there are certain areas that were not served by bus-stops within a two block radius (see Figure V-10). For some bus patrons, even the nearest bus stop along a route is quite a distance from their desired points of destination. With transfers in the CBD during peak period being both difficult and awkward because of crowded buses, some bus passengers walk a longer distance than where the nearest bus stop to their destinations are.

The transit model split calculation showed 0.387 and 0.337 respectively for cordon count and the O-D home interview survey. This is only 5% difference and it can be assumed that the two sets of results were compatible with each other (Table V-16).

In the case of auto driver trips, there were supposed to be more work-trips arriving in the CBD by this mode (from the O-D) than was actually counted by the cordon (Figure V-11). For this reason, the actual time difference between the arrival time in the CBD and the starting time of work cannot be determined in the same way as the transit trips without some form of adjustment being made to counteract the discrepancy of 1362 (13.6%) auto-driver work-trips (Table V-15).

Due to the difficult parking situation in the downtown area and the high associated costs, some drivers park their cars outside the 'cordoned' CBD area and walk to their places of employment. By doing so, they were either recorded as 'through-traffic' or if they

TABLE V - 16

MODAL SPLIT COMPARISON OF THE CORDON COUNT AND THE ORIGIN-DESTINATION SURVEY OF 1967

OF THE CENTRAL BUSINESS DISTRICT WORKTRIPS

TIME		CORDON COUNT ACCUMULATED TRIPS				ORIGIN-DESTINATION WORK-TRIPS			
FROM	TO	TRANSIT	VEHICULAR	TOTAL	MODAL SPLIT	TRANSIT	VEHICULAR	TOTAL	MODAL SPLIT
						OTHER		TOTAL	
						MODES		WORKTRIPS	
7:00	7:15	527	943	1470	0.357	285	493	778	0.367
7:15	7:30	725	1065	1790	0.405	361	792	1153	0.315
7:30	7:45	1267	2669	3936	0.323	159	421	580	0.275
7:45	8:00	1421	3168	4589	0.312	2113	4755	6868	0.308
8:00	8:15	2071	2582	4653	0.444	268	688	956	0.283
8:15	8:30	1146	1867	3013	0.380	2263	5046	7309	0.310
8:30	8:45	900	880	1780	0.510	151	217	368	0.410
8:45	9:00	1139	905	2044	0.522	1324	1593	2917	0.455
9:00	9:15	283	979	1262	0.224	105	68	173	0.608
9:15	9:30	477	636	1113	0.430	268	167	435	0.615
7:00	7:30	1252	2008	3260	0.384	646	1285	1931	0.334
7:30	8:00	2688	5837	8525	0.316	2272	5176	7448	0.306
8:00	8:30	3217	4449	7666	0.419	2531	5734	8265	0.306
8:30	9:00	2039	1785	3824	0.533	1475	1810	3285	0.450
9:00	9:30	760	1615	2375	0.320	373	235	608	0.613
TOTAL		9956	15694	25650	0.387	7297	14240	21537	0.337
						1685		23222	

FIGURE V-10

THE STREET LAYOUT OF THE CBD OF EDMONTON

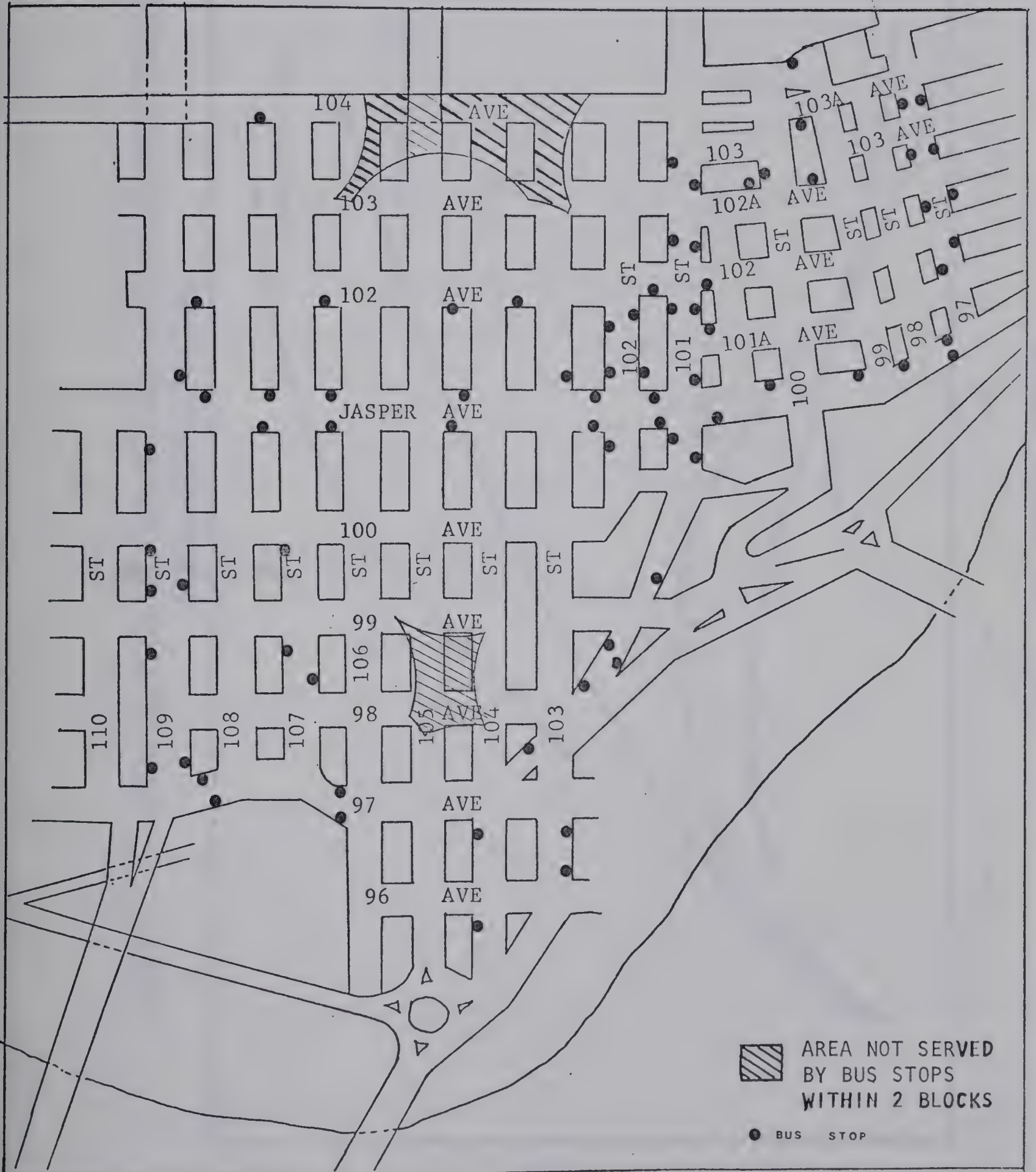
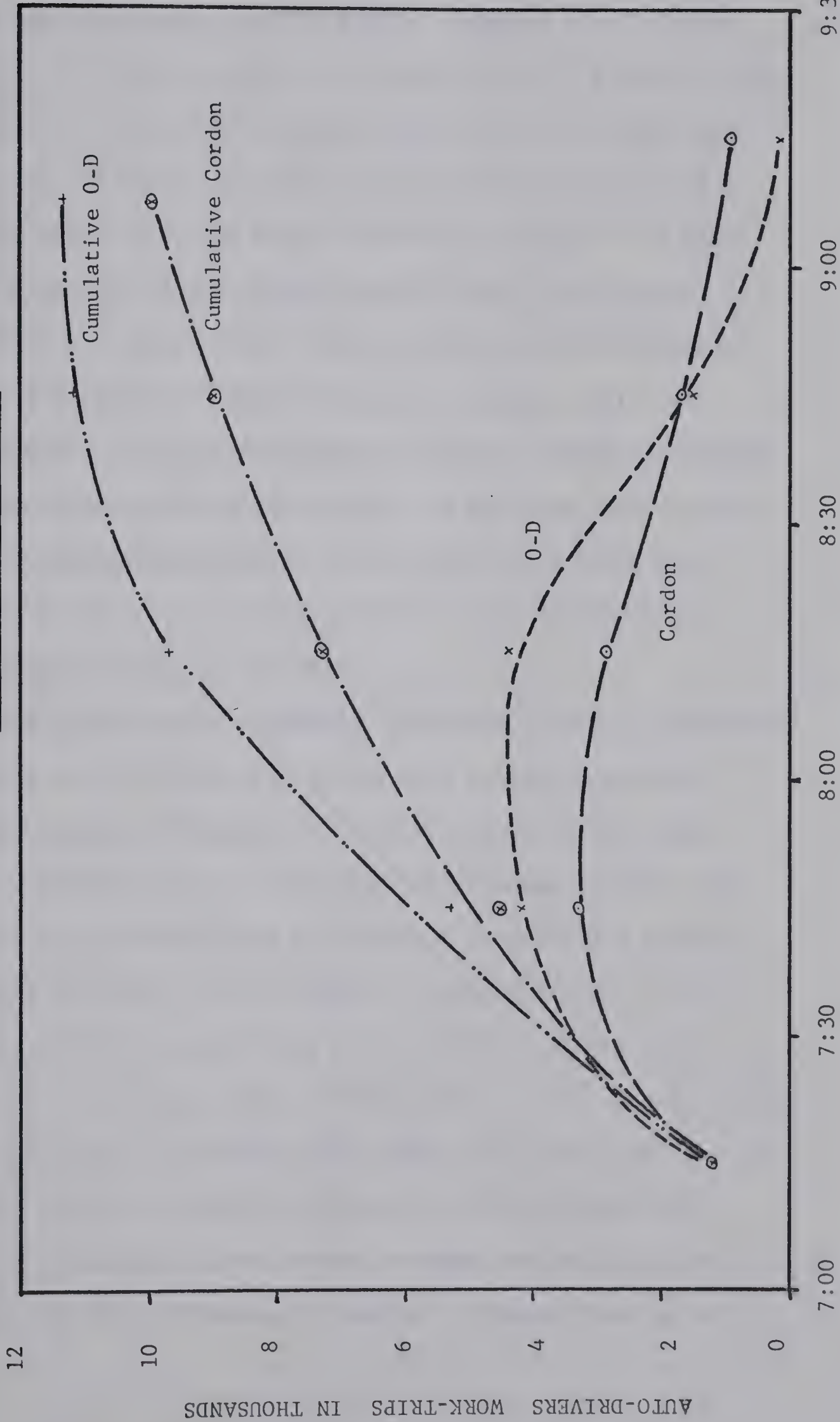


FIGURE. V -11 COMPARISON OF CORDON COUNT AND ORIGIN-DESTINATION SURVEY OF 1967
OF AUTO-DRIVER WORK-TRIPS



TIME - (THE MORNING PERIOD)

did not cross the cordon line, were never recorded at all (since 'walk-trips' were not counted in the cordon count). A total of 1352 work-trips were reported to have been made by CBD-residents for areas outside the cordon boundary. Since a fair proportion of these trips would be by the use of automobiles, some of the above mentioned error can be attributed to this fact. Other drivers brought along passengers (their wives, etc.) to drive their cars home. Table V-15 shows a high outbound or through-traffic of 15817 auto-driver trips during the morning hours thereby indicating that the above explanations were valid. In addition a fair number CBD-bound auto-passengers obtain 'rides' from drivers who work outside the cordon area and is part of the cause for the high volume of through-vehicular traffic.

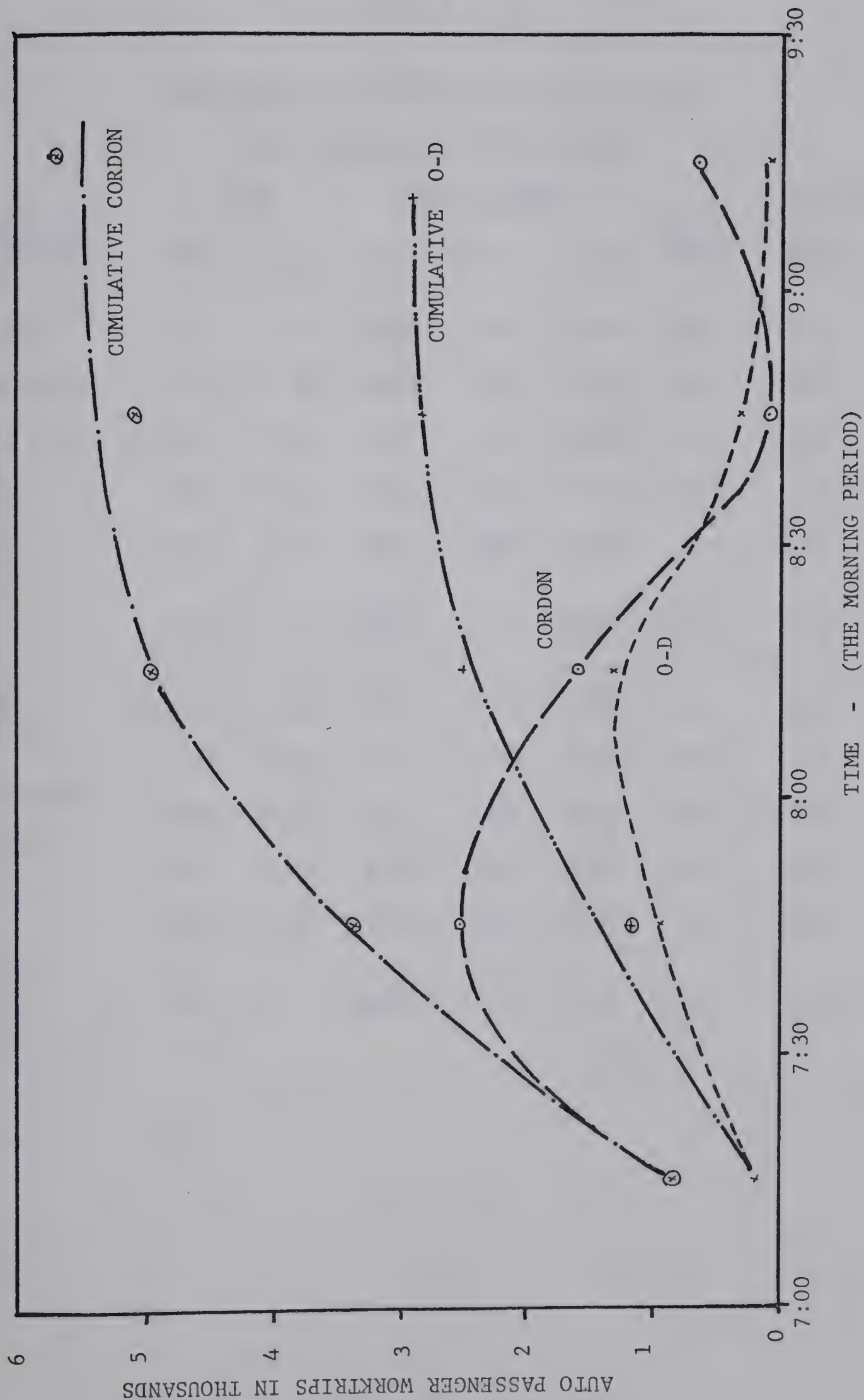
A highly encouraged and commonly practised system of 'car-pools' for reducing traffic congestion in the city centre is another explanation for the difference in results. In car-pools, each member of a group drove his car only on his allotted day while the others were his passengers and vice-versa. When the O-D questionnaires asked for their work-trip mode of transportation, it was given as auto-driver because they did in actual fact drive their cars to work, but only on their allotted days. There were 49.4% (2816) more auto-passengers recorded by the cordon count than by the O-D home survey indicating that the system of car-pooling and the bringing-of-a-passenger-to-drive-the-car-home were possibly the main causes for the difference in results, although there is no

exact way of quantifying them. This meant that direct comparisons between the cordon count and the Origin-Destination survey of auto-driver and passenger trips cannot be made without some form of error-'correction' procedure made to the O-D data (as in Figure V-12).

It was found that the uncertainty of quantities of correcting for erroneous O-D data could be eliminated by combining auto-driver and passenger trips into a different classification; i.e. auto work-trips. Table V-17 and Figure V-13 give tabular and graphical representation of the cordon count and the O-D comparison of the new classification. By the same method of shifting the time axis of the cumulative cordon count in Figure V-13 it was possible to estimate the average time difference between the arrival time and the actual time of starting work of auto work-trips. This was found to be 6 minutes, and considered quite realistic, since auto-tripmakers generally do not have to walk great distances from their vehicles to their points of destination.

A time difference of 7.5 minutes was estimated for the overall work-trips (Figure V-14) in the CBD (from 7:00 to 9:30 am.). This estimation correlated very well with the simple averaging calculation method - where the difference in the time between the arrival at the CBD boundary and the starting time of work was found to be 7.52

FIGURE. V-12 COMPARISON OF THE CORDON COUNT AND THE ORIGIN-DESTINATION SURVEY OF 1967
 FOR AUTO PASSENGER WORKTRIPS



COMPARISON OF THE ORIGIN-DESTINATION DATAWITH THE CORDON COUNT OF 1967

<u>TYPE OF WORKTRIPS</u>	<u>TIME</u>		<u>CORDON COUNT</u>			<u>O - D SURVEY</u>	<u>DIFFERENCE</u>	
	<u>FROM</u>	<u>TO</u>	<u>IN</u>	<u>OUT</u>	<u>NET</u>		<u>TRIPS</u>	<u>%</u>
Auto- Passengers and Driver	7:00	7:30	4850	2842	2008	1285	723	36.0
	7:30	8:00	10609	4772	5837	5176	661	11.3
	8:00	8:30	9266	4817	4449	5734	-1285	-28.9
	8:30	9:00	5782	3997	1785	1810	- 25	- 1.4
	9:00	9:30	4891	3276	1615	235	1380	85.4
	TOTAL		35398	19704	15694	14240	1454	9.3
Total Passenger Trips	7:00	7:30	7031	3771	3260	1931	1329	40.8
	7:30	8:00	14694	6169	8525	7448	1077	12.6
	8:00	8:30	14155	6489	7656	8265	- 609	- 8.0
	8:30	9:00	8753	4929	3824	3285	539	14.1
	9:00	9:30	6172	3797	2375	608	1767	74.4
	TOTAL		50805	25155	25650	21537	4113	16.0

FIGURE. V-13 COMPARISON OF THE CORDON COUNT AND THE ORIGIN
DESTINATION SURVEY OF 1967 FOR AUTO WORKTRIPS

AUTO PASSENGERS AND DRIVER WORKTRIPS IN THOUSANDS

A

CUMULATIVE
CORDON

CORDON

0 - D

TIME - (THE MORNING PERIOD)

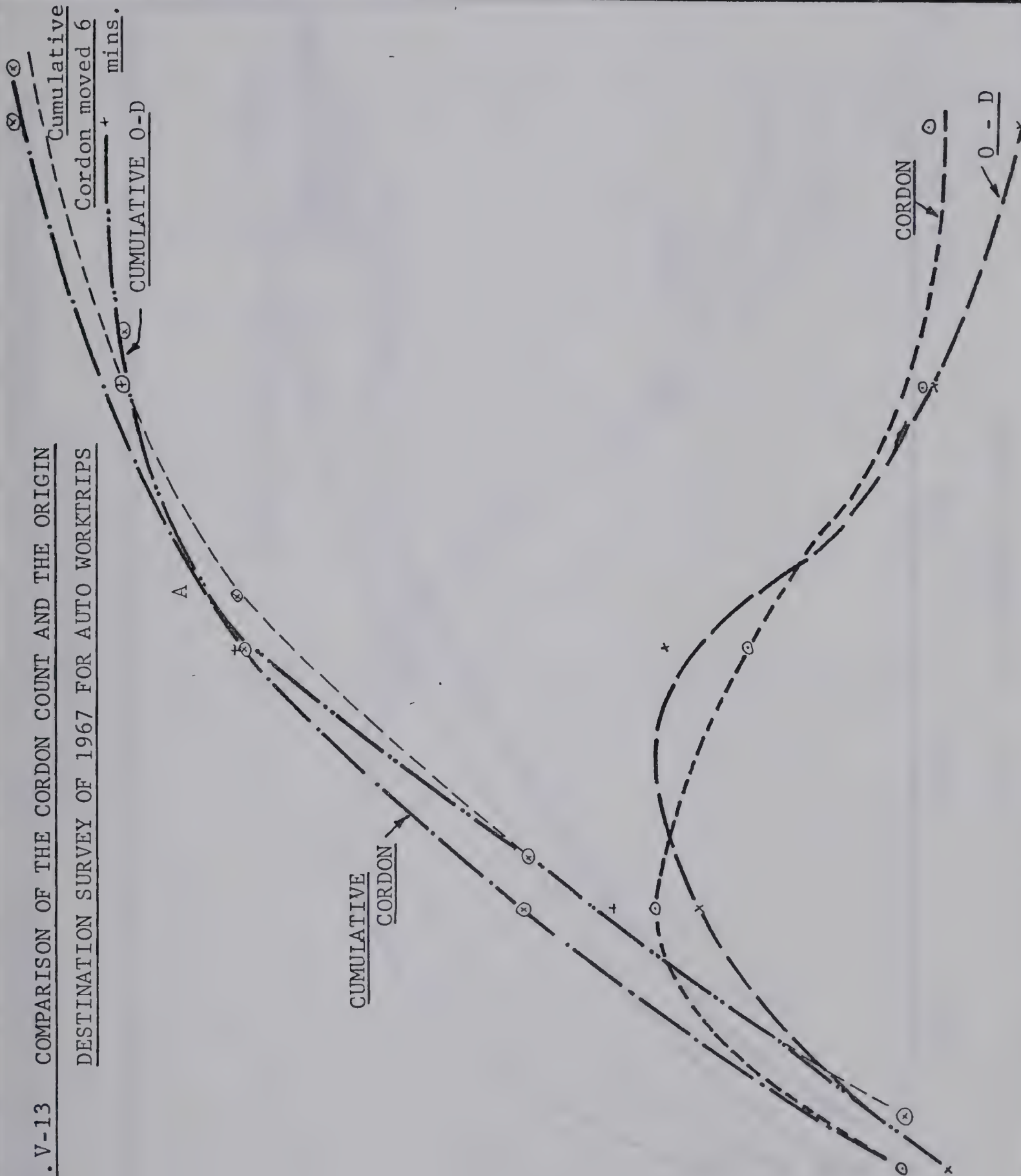
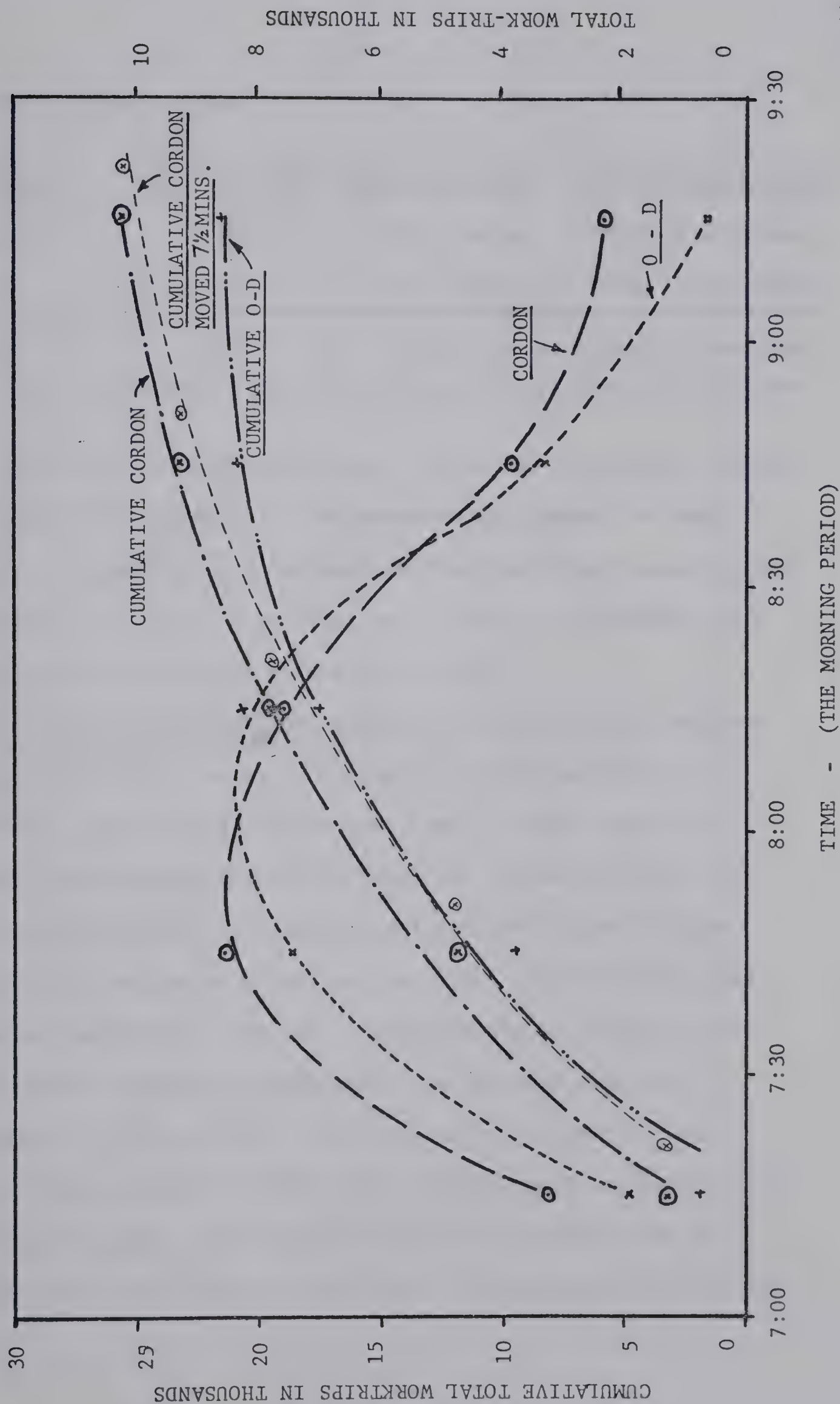


FIGURE. V-14 COMPARISON OF CORDON COUNT AND THE ORIGIN-DESTINATION SURVEY OF 1967
OF TOTAL PASSENGER-WORKTRIPS



minutes, as shown below:

<u>MODE</u>	<u>NO. OF TRIPS</u>	<u>TIME DIFFERENCE</u>	<u>TIME DIFFERENCE-TRIPS</u>
Transit	7297	10.5 minutes	76618 trip-minutes
Auto	14240	6.0 minutes	85440 trip-minutes
Total	25137	7.52 minutes	162058 trip-minutes

This indicates that the average travel time within the CBD for covering the last portion of the home-to-work journey is about $7\frac{1}{2}$ minutes. The excess time included walking time from transportation facility to the point of destination in addition to looking for a parking space in the case of the auto-drivers.

For the reasons mentioned above, the auto worktrips obtained through O-D survey have to be corrected for the various 'data gathering' errors before they can be used in their respective modes. Car occupancy figures derived from the cordon count for each half-hour period were used as multipliers to the O-D auto worktrip information to calculate the volume of auto-drivers and passengers arriving in the CBD. These calculated volumes, hereinafter called 'adjusted' worktrips of the referred mode were tabulated as in Table V-18. The adjustments reduced the auto-driver trips by 2139 (18.83%) whilst increasing the auto-passengers by the same number. This application of 'adjustments' was to correct for errors created by car-pools and passenger-to-drive-car-home.

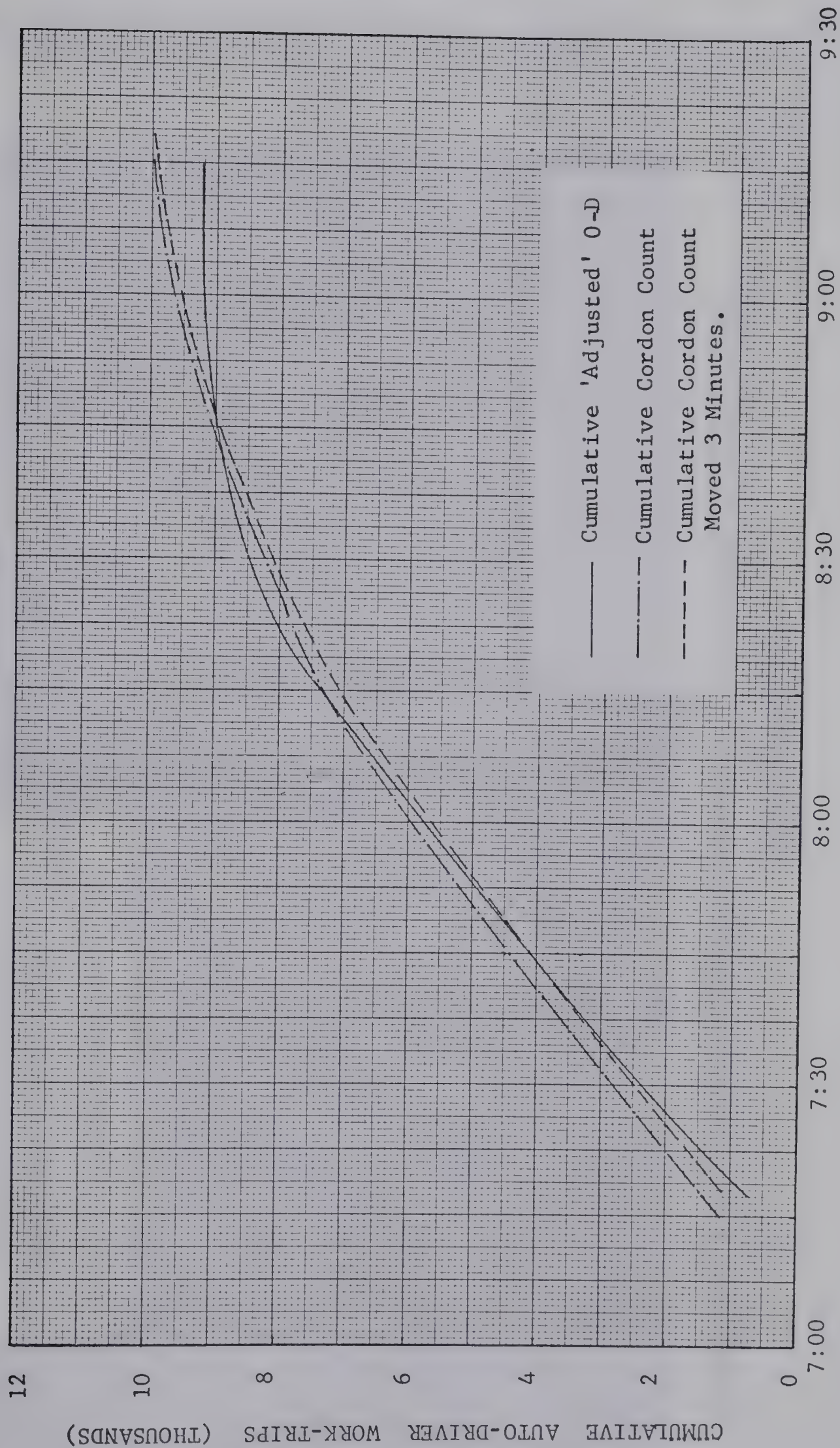
TABLE V - 18

ADJUSTMENT TO THE 1967 AUTO WORK-TRIPS

T I M E	C O R D O N				C O U N T		O R I G I N -		D E S T I N A T I O N		
	FROM	TO	AUTO PASSENGER	AUTO DRIVER	AUTO WORKTRIPS	AUTO OCCUPANCY	AUTO WORKTRIPS	AUTO DRIVER	AUTO PASSENGER		
7:00	7:30		849	1159	2008	1.733	1285	741	544		
7:30	8:00		2513	3324	5837	1.756	5176	2948	2228		
8:00	8:30		1597	2852	4449	1.560	5734	3675	2059		
8:30	9:00		92	1693	1785	1.054	1810	1717	93		
9:00	9:30		644	97	1615	1.663	235	141	94		
TOTAL			5695	9999	15694	1.596	14240	9222	5018		

FIGURE V - 15 (a)

COMPARISON OF 'ADJUSTED' O-D AUTO-DRIVER WORK-TRIPS WITH THE CORDON COUNT (1967)



TIME OF ARRIVAL (IN THE MORNING)

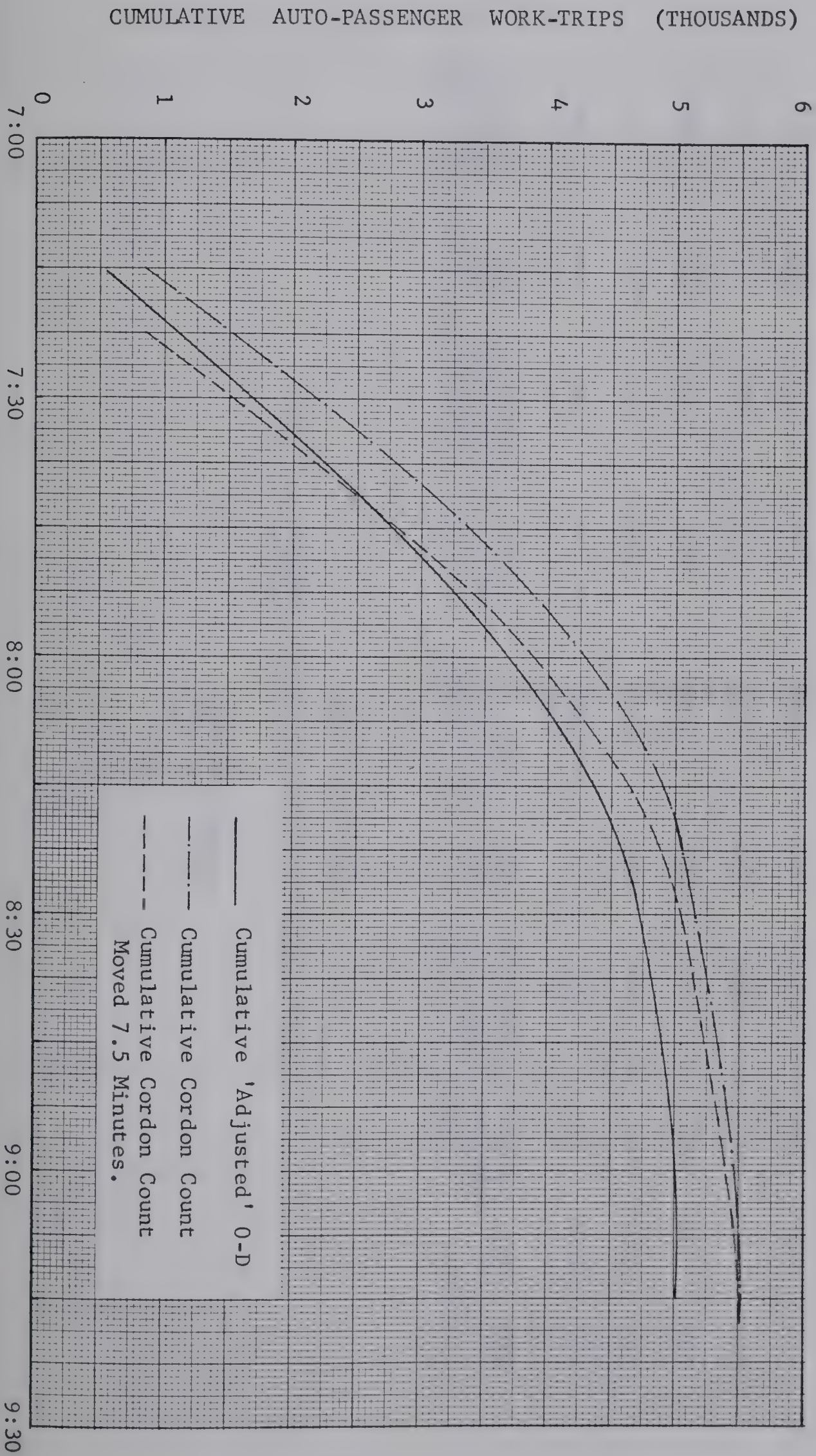


FIGURE V - 15 (b)

COMPARISON OF 'ADJUSTED' O-D AUTO-PASSENGER WORKTRIPS WITH THE CORDON COUNT (1967)

TABLE V - 19

1967 CORDON COUNT AND THE ADJUSTED O - D

AUTO WORKTRIPS

T I M E		A U T O - D R I V E R T R I P S				A U T O - P A S S E N G E R T R I P S			
FROM	TO	ADJUSTED O - D	CUMULATIVE ADJUST O-D	CORDON COUNT	CUMULATIVE CORDON	ADJUSTED O - D	CUMULATIVE ADJUST O-D	CORDON COUNT	CUMULATIVE CORDON
7:00	7:30	741	741	1159	1159	544	544	849	849
7:30	8:00	2948	3689	3324	4483	2228	2772	2513	3362
8:00	8:30	3675	7364	2852	7335	2059	4831	1597	4959
8:30	9:00	1717	9081	1693	9028	93	4924	92	5951
9:00	9:30	141	9222	971	9999	94	5018	644	5695
TOTAL		9222		9999		5018		5695	

When the adjusted figures of Tables V-18 and V-19 were plotted for comparison with the cordon count data (Figures V-15a and V-15b), it was found, as before, that auto-worktrips (both passengers and drivers) arrived in the CBD 6 minutes before the starting time of work.

All 1967 morning cordon count activities recorded were tabulated in 15 and 30 minutes intervals as shown in Table V-20. Here, it will be seen that 54.6% of the total activity occurs at the morning peak hour (7:30 to 8:30) when the through traffic percentage is at its minimum (43.9%), see Figures V-16 and V-17. The reduction of through-traffic could be due to the traffic congestion in the CBD at the peak hour resulting in 'voluntary' diversions of non-CBD bound worktrips. It should also be noted that highest car-occupancy was recorded in the peak hour indicating that the CBD workers were conscious of the degree of maneuverability through traffic during the 'congested' period.

An extremely close resemblance between the inbound work-trips and the total activity suggests that the through-traffic is in fact proportional to the inbound trips (Figure V-16).

TABLE V-20

1967 CORDON COUNT - TOTAL ACTIVITY IN CBD

<u>T I M E</u>		<u>T R A F F I C</u>		<u>T O T A L</u>	<u>P E R C E N T A G E</u>		
<u>FROM</u>	<u>TO</u>	<u>IN</u>	<u>OUT</u>	<u>A C T I V I T Y</u>	<u>IN</u>	<u>OUT</u>	<u>T H R U</u>
7.00	7.15	2817	1347	4164	67.6	32.4	48.0
7.15	7.30	4214	2424	6638	63.4	36.6	57.6
7.30	7.45	7074	3138	10212	69.2	30.8	44.3
7.45	8.00	7620	3031	10651	71.5	28.5	39.8
8.00	8.15	8046	3393	11439	70.3	29.7	42.3
8.15	8.30	6109	3096	9205	66.3	33.7	50.7
8.30	8.45	4376	2596	6972	62.7	37.3	59.4
8.45	9.00	4377	2333	6710	65.2	34.8	53.3
9.00	9.15	3295	2033	5328	61.8	38.2	61.7
9.15	9.30	2877	1764	4641	61.9	38.1	61.5
OVERALL		50805	25155	75960	66.8	33.2	49.5

IN 30- MINUTE INTERVAL

7.00	7.30	7031	3771	10802	65.1	34.9	53.6
7.30	8.00	14694	6169	20863	70.4	29.6	42.0
8.00	8.30	14155	6489	20644	68.6	31.4	45.8
8.30	9.00	8753	4929	13682	64.0	36.0	56.3
9.00	9.30	6172	3797	9969	61.9	38.1	61.5
OVERALL		50805	25155	75960	66.8	33.2	49.5

IN THE PEAK HOUR

7.30	8.30	28849	12658	41507	69.5	30.5	43.9
% of TOTAL		56.8	50.3	54.6			

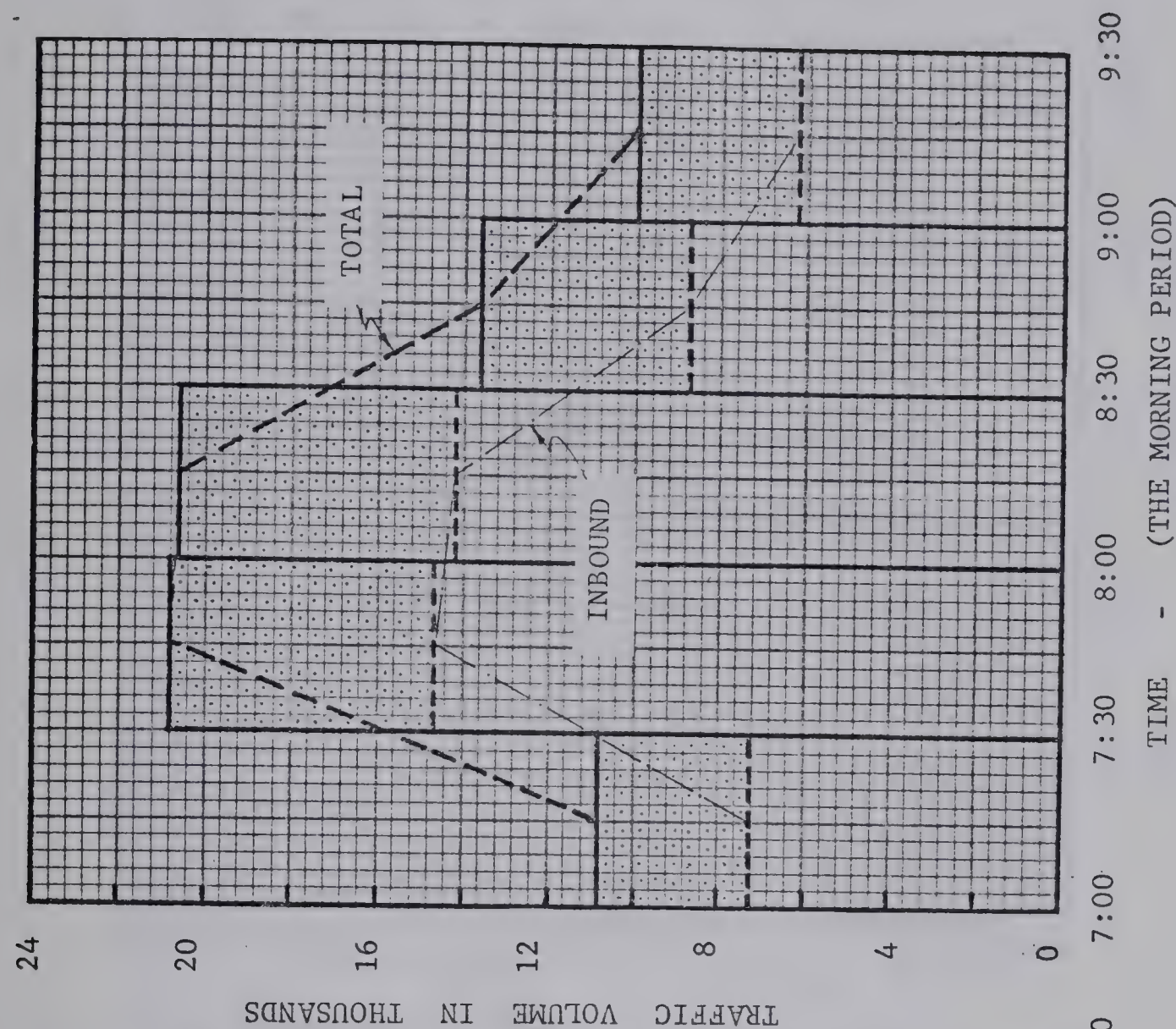
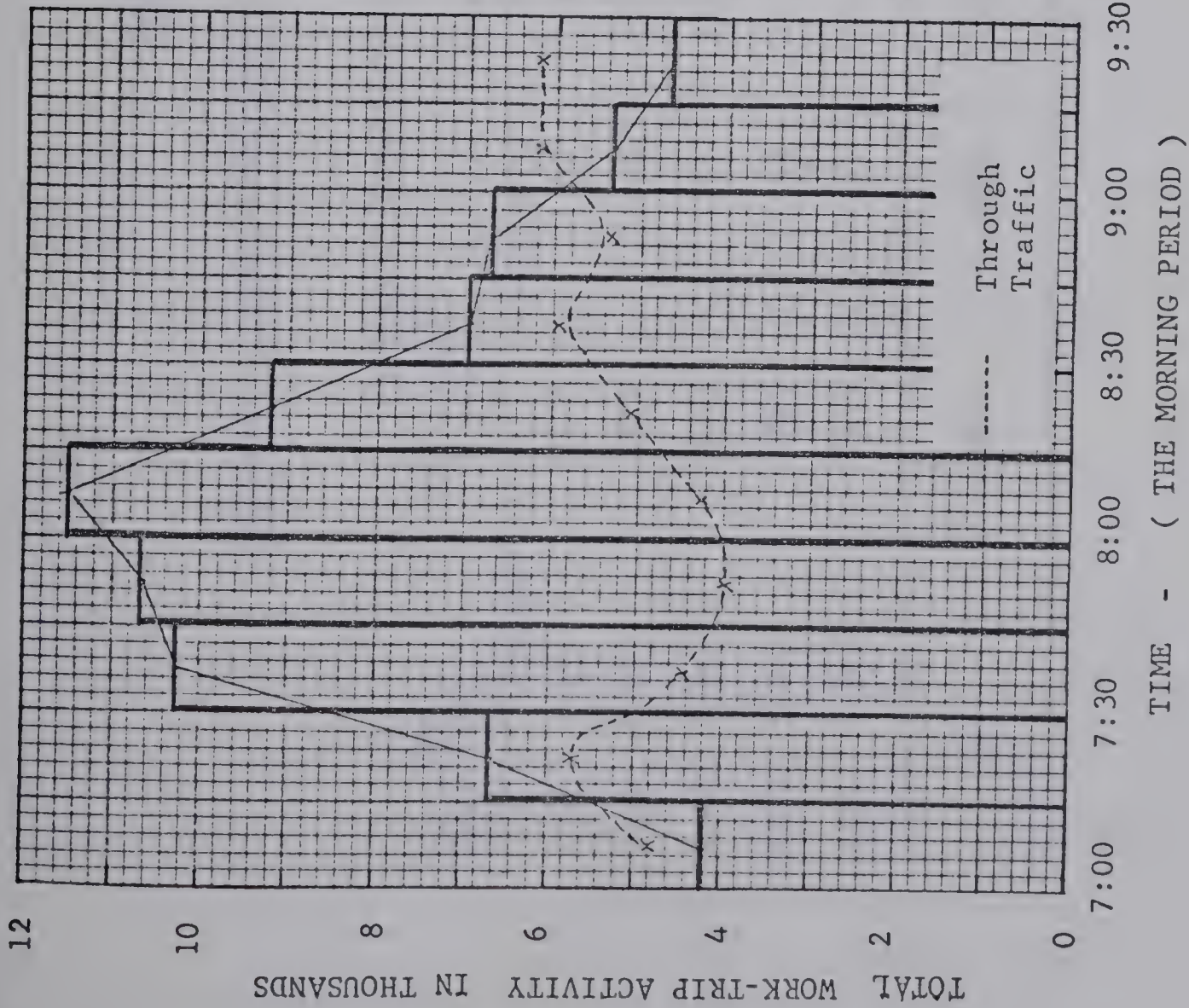
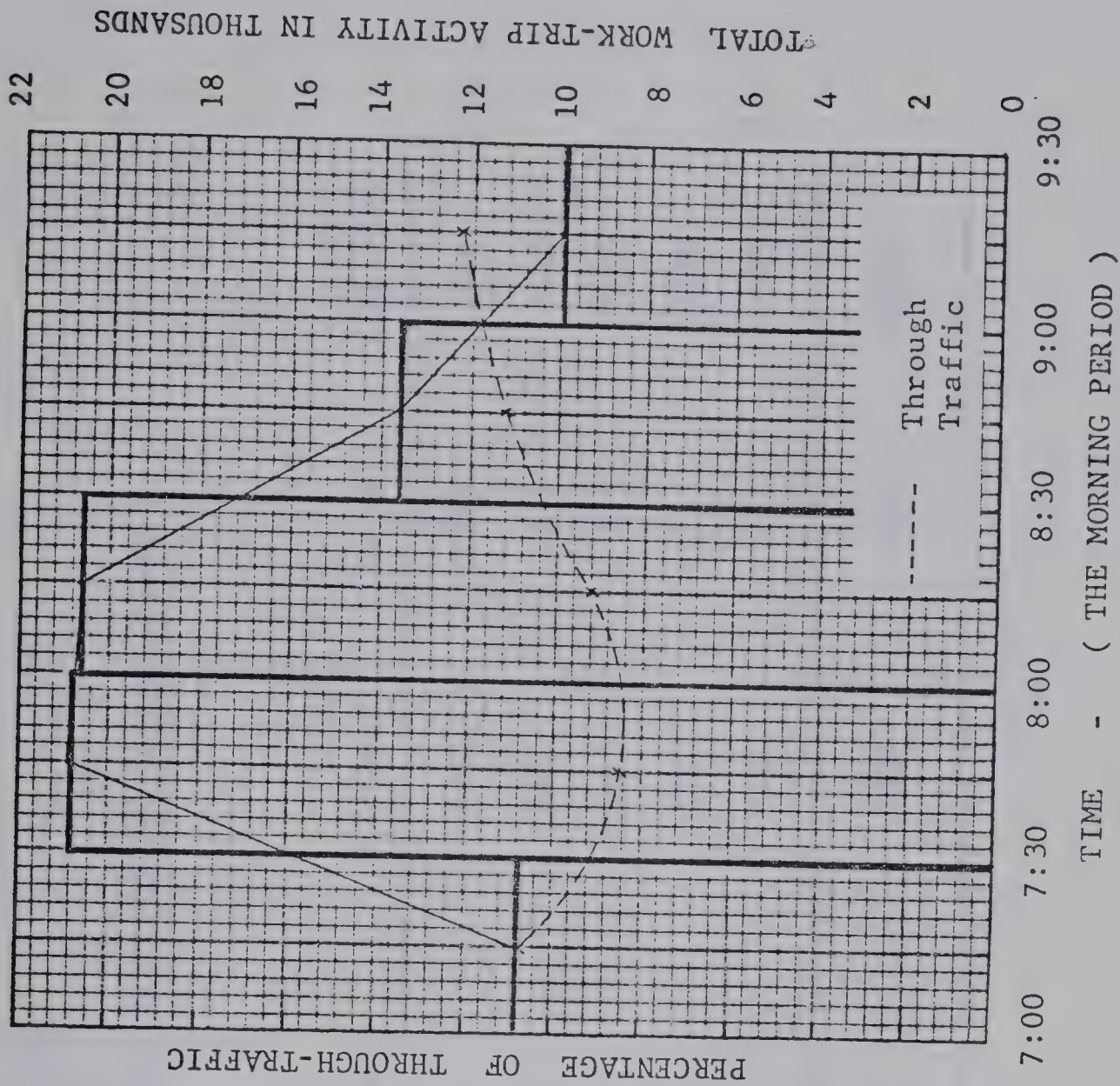


FIGURE V-16 TOTAL ACTIVITY AND THE INBOUND TRAFFIC OF THE CORDON COUNT
IN 15 AND 30 MINUTES TIME INTERVAL



(a)



(b)

FIGURE. V-17 HISTOGRAMS OF TOTAL ACTIVITY AND PERCENTAGES OF THROUGH-TRAFFIC
IN 15 AND 30 MINUTES TIME INTERVALS (CORDON COUNT, 1967)

TABLE V-21

AUTOMOBILE OCCUPANCY AND TRANSIT MODE SPLIT FOR 1967 CORDON COUNT

Time		Vehicular Worktrips			Transit Trips		Total
		Passengers & Drivers	Cars	Occupancy	Passengers	Mode Split	
From	To						Worktrips
7:00	7:30	2008	1159	1.733	1252	0.384	3260
7:30	8:00	5837	3324	1.756	2688	0.316	8525
8:00	8:30	4449	2852	1.560	3217	0.419	7666
8:30	9:00	1785	1693	1.054	2039	0.533	3824
9:00	9:30	1615	971	1.661	760	0.320	2375
Total		15694	9999	1.569	9956	0.387	25650

THE CROSS-RIVER TRAFFIC

On first look at the cross-river traffic generated at the bridges from the assignment programme for auto-driver trips based on the 1967 O-D survey, there appeared to be a distinct difference between itself and the actual bridge counts obtained from the City's Traffic Department. This difference was particularly prominent for south-bound traffic. On closer observation, it was discovered that all trips bound for the University and Northern Alberta Institute of Technology (NAIT) areas were not included in the 1967 O-D. This meant that corrections had to be made for the assigned figures.

Information regarding the University activities were available from the University of Alberta's Traffic and Parking Study of 1966 and 1967. All river-crossing movements were extracted for 'correcting' the assigned traffic on the bridges. A total of 1664 students and 1765 staff-members from the north-side brought their cars to the campus. Ratio of trip arrivals by time obtained from the University's Study for students (Table V-22) were utilized for approximating the distributory car traffic, while the staff volume were based on the CBD arrival patterns.

The location of the University of Alberta campus is situated such that the direct bridge accesses would mainly be Groat, High Level, and the 105th Street Bridges. It was considered that while there may be some trips made across the Low Level and Dawson Bridges, en route to the campus, the nature of the individual street capacity characteristics of the main links (on the south-side)

TABLE V-22

UNIVERSITY STUDENTS' CAMPUS ARRIVAL TIME

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Average	%
8:00	5245	5496	5053	5378	5476	5330	0.5877
9:00	3137	1073	2879	1036	3085	2242	0.2472
9:30	44	1626	57	1553	88	674	0.0743
up till							
9:30	8426	8195	7989	7967	8649	8246	0.9092
10:00	1306	318	1049	294	1156	825	0.0909
Total	9732	8513	9038	8261	9805	9069	1.000

Drivers from North Side = 1617; car owners = 1670

Drivers from St. Albert = 47; car owners = 50

Total Drivers 1664; Total 1720

from the east during the morning peak periods, such as 82nd Avenue (Whyte Avenue) and the Saskatchewan Drive (especially at 109th Street intersection), would divert many of these 'intended trips'. Therefore, the actual crossings of auto-trips, at these points, bound for the University area may be considered negligible for adjustment purposes. On this assumption, the University bound traffic need only be distributed to the three western bridges in their originally assigned proportions.

Both the original assigned and the corrected volume of the south-bound traffic are illustrated in Table V-23 and when compared with the actual bridge counts showed a certain amount of correlation. The Groat, Low Level and 105th Street Bridge volumes were extremely close to those of the actual bridge counts. However, for some reason the assigned volume of the High Level Bridge was only 10% of the registered crossing. This goes to indicate that there are many factors involved in a driver's decision of selecting a route and not just the "time-factor" as was used in the assignment programme. Among the contributing factors other than "time", are distance, number of turns to be made (especially left-hand ones), convenience, congestion and quality of roadway, and availability of alternatives en route in case of traffic "tie-ups".

A graphical representation of cumulative overall adjusted south-bound, cross-river work-trips (students going to University included in this category), is shown in Figure V-18b. If work-trips were taken as constituting 85% of total river-crossing

TABLE V-18

CUMULATIVE CROSS-RIVER
VEHICULAR TRAFFIC (1967)

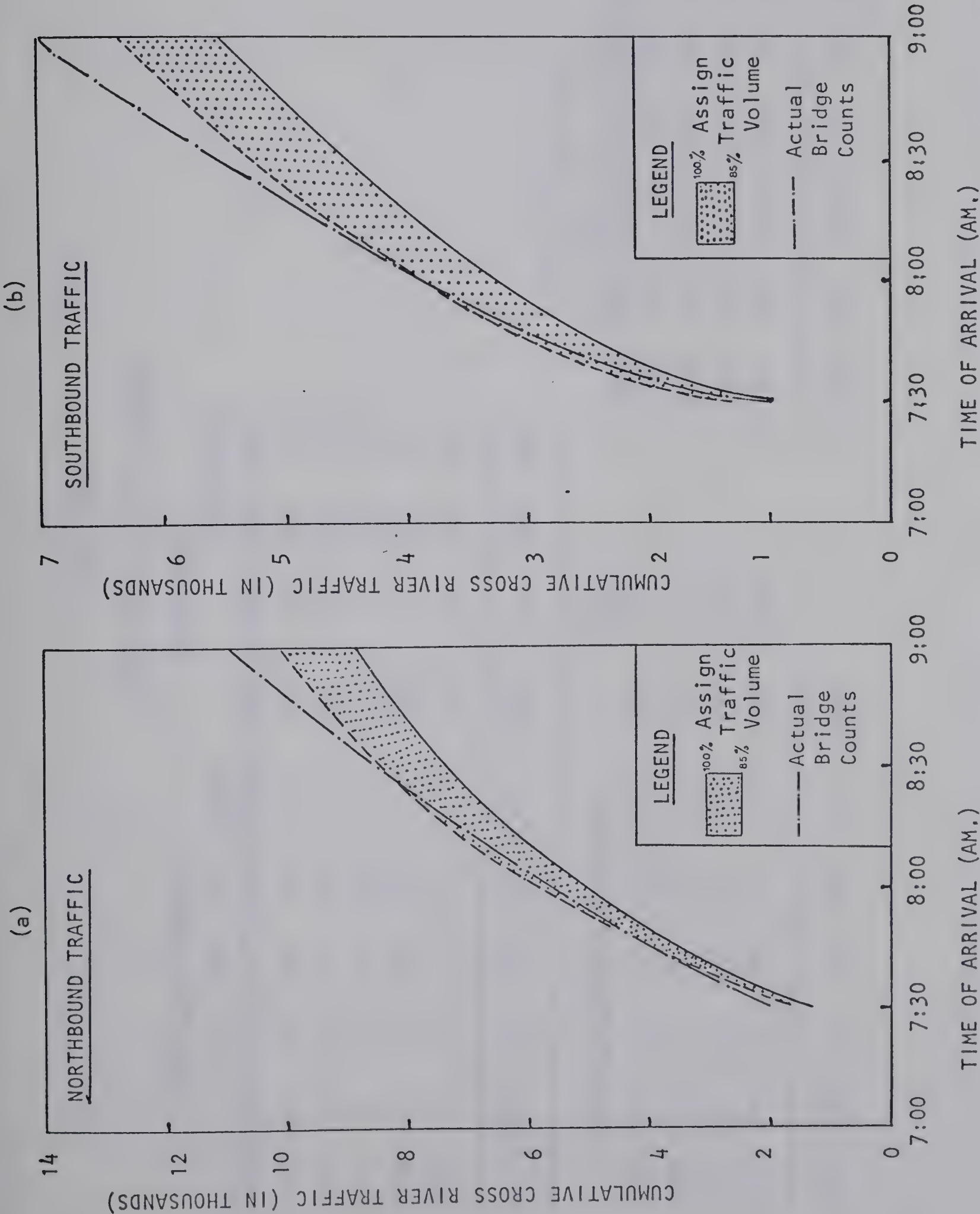


TABLE V-23

SOUTH BOUND TRAFFIC VOLUME

TRAFFIC ASSIGNMENTS					UNIVERSITY	
					CORRECTION	
Time	Groat Level	High 105th Street Level	Low Dawson Bridge	Total	Student	Staff Total
7:30	133	4	47	260	54	508
					279	128 407
8:00	337	5	107	636	144	1229
					691	498 1189
8:30	147	6	33	204	62	452
					212	568 780
9:00	117	6	23	196	79	425
					200	221 421
9:30	13	0	2	14	7	36
					124	42 166
Total	747	21	216	1320	346	2650
					1506	1457 2963
CORRECTED TRAFFIC ASSIGNMENT					ACTUAL BRIDGE COUNTS	
					High Groat Level	105th Street Level
					Low Dawson Bridge	Cum. Total
7:30	427	13	151	260	54	905
						905
8:00	1229	18	390	636	144	2417
						3322
8:30	757	39	170	204	62	1232
						4554
9:00	554	23	90	196	79	942
						5496
Total	2967	93	801	1296	339	5496
					High Groat Level	105th Street Level
					Low Dawson Bridge	Cum. Total
					433	160 182 244 150 1169 1169
					1411	304 304 345 273 2637 3806
					613	241 383 271 160 1668 5474
					561	208 326 266 146 1507 6981
					3018	913 1195 1126 729 6981

traffic as seen in Figure V-18b, an extremely close correlation is obtained between the actual counts and the assigned figures.

For the north-bound traffic, adjustments were made proportionally for all the bridges, based on the NAIT students and Staff car trips (information was obtained from the Traffic Department) and is shown in Table V-24. In the same way, as for the south-bound traffic, the results were found to be quite compatible with actual counts. It should be noted that because of the awkward 5-leg intersection at 109th Street and 88th Avenue, which forked out towards the entrances of the High Level and 105th Street bridges, many a quick decision has been made to decide on the bridge to use. It was felt that for analytical purposes the traffic volumes for these two bridges should be aggregated.

With the exception of the Low Level bridge, traffic on the other bridges produced extremely good correlation. Apparently, during the assignment, diversion from the Low Level Bridge was made because of the minimum "time-factor" used in the programme. However, overall results of the cumulative volumes produced good compatibility as shown in Figure V-18a. The use of 85% constituent "trips" correction is illustrated in the same figure.

While the figures of Tables V-23 and V-24 show that individual bridge-crossing volumes may not be compared directly due to the complexity of factors involved in the personal decisions and available choices, although the overall results produced bore good similarity with the actual bridge counts. This, therefore, proves

that while assignment of traffic of this nature can be resorted to in demand study of network links, the traveller's personal and available choice should be studied in greater detail to get a better understanding on how decisions of this kind are usually made. As can be seen from the above, assignments of traffic through a street network using the "minimum time" factor can produce substantial distortion in results.

Time did not permit the exploration of decision making criterias to be used for "adjustments" to the assigned traffic volumes. It should be pointed out that future work of traffic assignments of this nature should include the more thorough study of the above-mentioned factors.

TABLE V-24

NORTH BOUND TRAFFIC VOLUME

TRAFFIC ASSIGNMENT					NAIT CORRECTION				
Time	Groat Level	High 105th Street Level	Low Dawson Bridge	Total	Student	Staff Total			
7:30	297	437	46	84	311	1175	72	35	107
8:00	911	1373	133	195	823	3435	204	137	341
8:30	516	1219	78	112	482	2451	80	156	236
9:00	326	403	39	63	273	1127	36	61	97
9:30	35	52	9	8	43	147	35	12	47
Total	2085	3484	305	462	1999	8335	427	401	828

ACTUAL BRIDGE COUNTS

CORRECTED TRAFFIC ASSIGNMENT					Cum. Total	
7:30	324	477	50	92	339	1282
8:00	1001	1509	146	214	905	3775
8:30	566	1336	86	123	528	2639
9:00	354	437	42	68	296	1197
Total	2245	3759	324	497	2068	8893
					4083	

ACTUAL BRIDGE COUNTS					Cum. Total	
Groat Level	High 105th Street Level	Low Dawson Bridge	Total			
209	198	307	576	691	1981	1981
561	469	668	1165	557	3420	5401
787	380	1027	1027	484	3270	8671
505	288	658	658	332	2226	10897
2062	1335	2660	3426	2064	10897	
					3995	

CHAPTER VI

RELIABILITY OF THE 1967

ORIGIN-DESTINATION DATA FOR TRAFFIC ASSIGNMENT

A number of prominent factors have led the author to investigate into greater depth the quality content of the 1967 O-D data as used for analysis in the establishment of travel pattern in the preceding few chapters. These computations were based on the assumption that the sample size was 100% when apparently it was not so.

Included among these factors was the low employment of 27,946 being attracted to the CBD as indicated by the O-D survey. The Traffic Department of the City estimated that about 32,000 employees made their way to the downtown district in 1967. This would indicate that the O-D information was about 87% of the planning body's estimate.

Trip generation for all origin zones in the entire city totalled only 106,184 worktrips. From the adjustments of unaccounted-for persons under the age of 21 (as will be described in greater detail in the next section of this Chapter), it will be established that a volume of 126,048 worktrips should have been generated. In this case, the O-D data was calculated to be about 84.2% of the estimated generated traffic.

Below shows the adjustments that were made to correct for errors involved in the cordon count survey of 1966, for traffic bound

for the downtown regions up till 9:30 am.

a) Cordon Count up till 9:30 am	26,560	
b) Allowance for survey errors and auto driver adjustment (as per Chapter V)	<u>2,139</u>	
Remaining downtown bound traffic	24,421	24,421
c) Unaccounted-for CBD residents movements		
i) 90.92% of 404 Students		367
ii) 83.1% of 1352 employees outside cordoned area		1,122
iii) 83.1% of 1545 employees within the cordoned area (assuming they were all walk-trips)		1,275
iv) 83.1% of 517 other walk-trips		<u>429</u>
Corrected Cordon Count (up till 9:30 am) which is 83.1% of the total work-trip arrivals of <u>33,218</u>		<u>27,604</u>

This is a very close figure when compared with the estimated worktrip generation made by the Traffic Department. The O-D data was only 83.5% of this corrected value.

The Dominion Bureau of Statistics (DBS) of 1966 Population Survey recorded 105,016 dwelling units and 110,224 households within the City of Edmonton, Population counts were shown at 401,299 persons, while the Civic Census of the same year only indicated 381,230; the latter being 95% of the former. If the DBS figures were 'adjusted' by a 5% correction the following would be obtained:

	<u>1966 DBS</u>	<u>1966 Civic Census</u>
Population	401,299	381,230
Number of Dwelling Units	105,016	99,764 (calculated)
Number of Households	110,224	104,711 (calculated)

$$1967 \text{ Growth rate} = 393,205/381,230 = 1.0315$$

$$\therefore 1967 \text{ Number of Households} = 1.0315 \times 104,711 = 108,012$$

$$\therefore 1967 \text{ Number of Dwelling Units} = 1.0315 \times 99,764 = 102,906$$

From the DBS results of 1966, the person/household of 3.63 was indicated for the City. However, on the application of the 5% correction to this figure (based on the population, i.e. 381,230/401,299) and the growth factor for the following year (1967) a person/household ratio of 3.82 was produced. It has been estimated that the City of Edmonton should have a ratio of 3.75. The O-D information for 1967 only recorded 75,422 dwelling units in the City while the "adjusted" DBS results showed 99,764 for 1966 and 102,906 the following year. The former survey is about 75.6% of the adjusted DBS figure, indicates quite evidently the incompleteness of the O-D survey.

Peak Hour comparisons were as follows:

a) Cordon Count recorded	16,191	Worktrips
b) CBD residents working out of cordoned area	821	These out-going trips were recorded as thru' trips
b) CBD residents working inside the cordoned area	938	These trips were made within the area and unrecorded
c) Students going out of surveyed area	247	
d) Other trips (e.g. walk, etc.)	313	
Total "corrected" peak hour trips	18,510	
Original O-D peak worktrip	16,972	= 91.7%

A very striking feature that was observed during the examination of the 3 O-D studies was the display of an extremely consistent employment/population ratio. About 27 people out of every hundred was employed for 1961, 1964 and 1967. This goes to indicate that the sampling errors were consistent, i.e., about the same group of people were not reached in the home-interviews. Since the travel patterns of 1964 and 1967 were very much alike, and because of the consistent sampling errors; the analysis and computations (as performed in the preceding few chapters) were valid. The correction procedure (as shown below) would indicate that the employment ratio should be about 32%.

Adjustments of the 1967 Origin-Destination Information

Several indications (as mentioned above) have pointed out that the data collection of the 1967 O-D survey was not extended to the full coverage of the population; and that the home-interview informations gathered were incomplete. The author has been made to feel (from the raw O-D data) that the O-D survey has a complete record of persons over 21 as far as occupational activities were concerned. As a result it was realized that attempts had to be made to re-adjust the existing data information to cover a more complete range of the populace. Thus, the following procedure was used:

- 1) A search was made into the original record books of the home-interviewers. All occupational figures of the residents of each origin zone were extracted to be tabulated into their respective occupational classification. The classifications were broadly divided into the various activities of individuals living in the area and they consisted of the following:
 - a) housewives
 - b) retired
 - c) students (university and NAIT)
 - d) unemployed
 - e) employed
 - f) school
 - g) pre-school

Zone or Poll	POPULATION		HOUSEHOLDS		HOUSEWIVES		RETIRED		STUDENT		UNEMPLOYED		EMPLOYED		PRESCHOOL		SCHOOL		UNDER 21 NOT ACCOUNTED FOR						
	Under 21	Over 21	Total	No.	Per Persons	Count	Calc.	%	No.	%	Count	Calc.	%	Count	Calc.	%	No.	%	No.	%					
0310	553	2184	2737	1277	2.15	322	383	14.8	248	0.9	64	134	4.9	60	80	0.3	1490	1570	57.5	131	4.8	191	7.0	231	8.5
0720	1429	3460	4889	1743	2.81	874	914	18.6	247	5.1	92	192	3.9	70	110	2.3	2077	2216	45.4	414	8.5	796	16.2	319	6.5
0830	1132	1309	2441	613	4.0	395	415	17.1	73	3.0	33	123	5.0	8	18	0.7	800	841	34.4	217	8.9	754	20.9	161	6.6
0840	299	353	652	176	3.80	101	106	16.3	6	0.9	3	23	3.5	6	8	1.2	237	242	37.2	126	19.3	141	21.6	32	4.9
0869	1553	2577	4130	1313	3.15	694	754	18.2	131	3.2	102	262	6.4	27	43	1.0	1623	1723	41.7	465	11.3	752	18.2	336	8.1
0870	2338	3073	5411	1480	3.66	905	961	17.8	251	4.6	61	211	3.9	34	74	1.4	1821	1931	35.7	483	8.9	1497	27.7	358	6.6
0930	2843	3068	5911	1462	4.04	1110	1120	19.0	110	1.9	52	312	5.3	18	37	0.6	1778	1898	32.1	571	9.6	1863	31.5	409	6.9
0940	1845	1651	3496	789	4.43	676	681	19.5	36	1.0	41	181	5.2	9	19	0.5	889	934	26.7	346	9.9	1299	37.2	200	5.7
0960	72	78	150	31	4.85	28	28	18.7	2	1.3	2	4	2.7	1	2	1.3	39	40	26.7	17	11.3	57	38.0	4	2.7
1032	50	61	111	29	3.84	21	21	18.9	1	0.9	2	2	1.8	1	1	0.9	36	36	32.5	16	14.4	34	30.6	0	0
1041	1038	939	1977	448	4.41	336	340	17.2	15	0.7	8	58	2.9	5	10	0.5	575	590	29.9	296	15.0	668	33.8	74	3.7
1042	978	875	1853	426	4.35	348	348	18.8	15	0.8	9	33	1.8	1	7	0.4	503	514	27.7	302	16.3	634	34.2	42	2.3
2220	722	1074	1796	479	3.75	393	393	21.9	65	3.6	98	228	12.7	7	12	0.6	511	531	29.6	86	4.8	481	26.8	155	8.6
2250	836	723	1559	336	4.65	298	298	19.2	23	1.5	33	98	6.3	0	8	0.5	369	394	25.2	120	7.7	618	39.6	98	6.3
2450	770	719	1489	333	4.47	240	248	16.7	21	1.4	10	35	2.3	8	13	0.9	440	480	32.2	151	10.1	541	36.4	78	5.3
2620	1061	1753	2814	818	3.44	512	522	18.6	69	2.5	44	109	3.9	11	18	0.6	1117	1147	40.7	355	12.6	594	21.1	112	4.7
3050	1423	1242	2665	621	4.30	504	504	18.9	15	0.5	18	88	3.3	2	10	0.4	703	723	27.2	458	17.2	867	32.5	98	3.58

TABLE VI-1

CORRECTION OF SAMPLE ZONES

A sample table of this endeavour is shown in Table VI - 1.

- 2) It was believed that records of all persons over 21 and those pre-school and schooling children were correctly surveyed. Therefore, it remained that some housewives, students, unemployed and employed, under 21, were not accounted for and the figure for adjustments was to be based on the "balance" of the difference between the civic census populations count and the O-D survey record for each traffic zone.
- 3) The City of Edmonton's Traffic Department has in its files O-D surveys made of the students of the University of Alberta and The Northern Alberta Institute of Technology, in its course of study of their traffic implications. From these surveys (Table VI - 2), the number of students from each origin zone can be determined quite easily and consequently the updating of the 1967 O-D survey data for student activities can be facilitated.
- 4) By computing the difference between the civic census count of zonal population and those of the sum of the extracted occupational activities, the balance can be distributed proportionally. Groups affected were:
 - a) housewives,
 - b) unemployed and
 - c) employed persons

- 5) This re-adjusting procedure was performed for every zone in the City and the "calculated" employment figures were then tabulated separately.
- 6) Assuming the ratio of CBD employees from each zone was constant, the downtown employment came up to 32,189 (Table VI - 3). This was considered an extremely good adjustment and compares favourably with the estimate made by the Traffic Department for the year 1967.

The above procedure brought the total employment of the City from 106,184 to 126,048, the former figure being 84.5% of the latter, indicating that on an average, a 15% correction is needed to be applied to the original O-D data.

As a result of the adjustments made to the employment figures, a very simple programme was used to re-adjust and re-distribute the employment at each destination zone in the original proportion. During the first adjustment, the programme produced a CBD employment of 34,849. This was further readjusted in order that the CBD may attract only 32,189 work-trips. Consequently, the other zones had to be re-adjusted during the "2nd correction". The output of the programme is illustrated in Figure VI - 1. In addition a generated peak hour work-trip traffic was incorporated in the programme based on an arrival ratio of 60.7%.

Since all indications seemed to point out that the "supposedly 100%" sample of the 1967 O-D was actually based on a sample size between 84 - 87%, adjustments based on the "85% constituent" sample

appeared to "tie-in" very closely with the calculated (estimated) figures (Table VI - 4).

EMPLOYMENT BY ZONE 1967

20-F	1967 O-D SURVEY				1ST CORRECTION			2ND CORRECTION			CORRECTED PEAK TRIPS		
	MALE	FEMALE	TOTAL	MALES	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
10	7156	4191	11347	63.07	8920	5224	14144	8240	4825	13065	5001	2929	7930
20	4072	3202	7274	55.93	5076	3901	9067	4689	3686	8375	2846	2238	5084
30	999	285	1285	77.74	1245	357	1602	1150	330	1480	698	200	898
40	2103	1133	3236	65.94	2734	1412	4146	2525	1305	3830	1533	792	2325
50	1376	153	1529	53.50	219	191	410	263	176	439	123	107	230
60	2695	1561	4256	62.44	3235	1945	5180	2988	1797	4785	1814	1090	2904
70	228	11	239	95.40	284	14	298	263	12	275	159	8	167
110	781	254	1035	75.46	973	317	1290	1001	327	1328	608	198	806
120	622	183	805	76.79	775	235	1010	798	241	1039	484	147	631
130	14	4	18	77.78	17	5	22	17	6	23	11	3	14
140	274	557	1431	61.08	1089	605	1784	1121	715	1836	681	433	1114
150	600	195	795	75.47	748	243	991	770	250	1020	467	152	619
210	2239	1538	3777	59.02	2856	1917	4783	2950	1972	4922	1790	1198	2988
220	541	701	1242	43.56	674	874	1548	694	899	1593	421	546	967
230	1183	215	1398	84.62	1475	263	1743	1513	276	1794	921	168	1089
240	869	280	1149	75.63	1083	349	1432	1115	359	1474	677	218	895
250	1247	412	1659	75.44	1579	514	2093	1625	529	2154	987	320	1307
260	257	148	405	63.46	320	185	505	329	191	520	200	116	316
310	1152	1164	2317	49.76	1437	1451	2888	1479	1493	2972	898	906	1804
320	347	104	453	76.60	433	132	565	446	135	581	270	83	353
330	450	264	723	63.49	572	329	901	589	338	927	357	206	563
340	619	292	911	67.05	772	364	1136	794	375	1169	482	228	710
410	299	56	355	78.47	261	69	330	269	71	340	163	43	206
420	53	12	65	31.54	66	15	81	68	15	83	41	9	50
430	124	62	186	66.67	155	77	232	160	79	239	97	48	145
440	68	49	117	58.12	85	61	146	87	63	150	53	38	91
510	301	127	428	70.33	375	158	533	386	163	549	234	99	333
520	307	137	444	69.14	383	170	553	394	175	569	239	106	345
530	444	23	467	64.23	578	104	682	595	107	702	361	65	426
540	935	193	1128	82.89	1165	241	1406	1199	248	1447	728	150	878
550	391	99	490	81.46	487	111	598	501	114	615	304	69	373
560	463	117	580	79.83	577	146	723	584	150	734	361	91	452
610	1154	157	1311	88.02	1433	196	1634	1480	202	1682	899	122	1021
615	1093	132	1225	90.22	1362	165	1527	1402	170	1572	851	103	954
620	316	17	333	92.18	1142	21	1163	1175	22	1197	713	14	727
710	368	126	494	74.49	459	157	616	472	162	634	287	98	385
720	372	420	792	46.97	464	523	987	478	538	1016	290	327	617
730	708	227	935	75.72	883	282	1165	909	290	1199	551	177	728
810	310	81	391	79.23	386	101	487	397	104	501	241	63	304
820	224	56	280	72.26	279	107	386	287	110	397	174	67	241
830	44	43	87	53.57	55	53	108	57	54	111	34	33	67
840	76	34	110	69.09	95	42	137	98	43	141	59	27	86
850	239	381	620	38.55	298	475	773	307	489	796	196	297	493
860	31	61	92	57.04	101	76	177	104	78	182	63	47	110
870	166	134	300	55.33	207	167	374	213	172	385	129	105	234
880	146	69	215	67.91	182	86	268	137	39	275	114	54	168
910	60	27	87	71.69	86	34	120	33	34	123	54	21	75
920	145	70	215	64.73	181	98	279	186	101	287	113	61	174
930	118	95	213	55.40	147	119	265	151	122	273	92	74	166

FIGURE VI-1
SAMPLE OUTPUT OF 'CORRECTION' TO O-D DATA FOR
EMPLOYMENT BY DESTINATION ZONES

EMPLOYMENT BY ZONE 1967

ZONE	1967 O-D SURVEY			1ST CORRECTION			2ND CORRECTION			CORRECTED PEAK TRIPS		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
940	20	5	25	25	6	31	26	6	32	16	3	19
950	6	0	6	7	0	7	7	0	7	4	0	4
960	10	0	10	12	0	12	12	0	12	7	0	7
1010	232	203	441	297	253	550	306	260	566	185	159	344
1015	164	234	398	192	282	474	198	390	493	120	142	262
1020	67	53	120	84	66	150	85	68	154	52	41	93
1031	108	58	166	135	72	207	139	74	213	84	45	129
1037	19	13	32	24	16	40	25	16	41	15	10	25
1041	36	30	66	45	37	82	46	38	84	28	23	51
1042	9	13	22	11	16	27	11	17	28	7	10	17
1110	14	10	24	29	12	41	21	12	33	12	9	20
1120	86	34	120	107	43	150	110	44	154	67	26	93
1130	456	198	654	568	247	815	585	254	839	355	154	509
1140	321	99	420	400	124	524	412	127	539	250	77	327
1145	83	95	178	103	119	222	106	122	228	65	73	138
1150	71	47	118	88	50	147	91	60	151	55	37	92
1160	93	65	158	116	82	198	119	85	204	72	52	124
1170	89	37	126	111	46	157	114	48	162	69	29	98
1180	815	126	941	1016	157	1173	1046	161	1207	635	98	733
1190	300	21	321	374	39	413	385	40	425	234	24	258
1210	300	38	338	374	47	421	385	48	433	233	30	263
1220	1454	272	1726	1812	339	2151	1865	349	2214	1132	212	1344
1230	1473	279	1752	2002	347	2433	2153	357	2519	1306	219	1524
1310	148	97	245	209	121	330	215	125	340	131	75	206
1320	253	67	320	315	84	399	324	87	411	197	52	249
1330	186	104	290	232	129	361	239	133	372	145	81	226
1340	139	103	242	173	129	302	178	133	311	108	81	189
1410	405	226	631	505	232	737	520	290	810	316	176	492
1415	146	223	369	297	274	481	213	262	495	129	171	300
1420	240	168	408	424	209	633	436	215	651	264	131	395
1430	106	76	182	132	95	227	136	98	234	83	59	142
1440	210	74	284	262	92	354	270	94	364	163	58	221
1510	245	64	309	330	80	410	340	82	422	206	50	256
1520	533	123	656	664	160	824	683	165	848	415	100	515
1530	503	60	563	727	112	839	748	115	863	454	70	524
1540	68	26	94	85	32	117	87	33	120	53	20	73
1550	65	8	73	60	10	70	62	10	72	37	7	44
1610	178	90	268	222	123	345	228	127	355	138	77	215
1620	57	27	84	71	34	105	73	35	108	44	22	66
1630	58	23	81	72	35	107	74	36	110	45	22	67
1710	32	11	43	40	14	54	41	15	56	25	9	34
1720	2	1	3	2	2	4	2	2	4	2	0	2
1810	52	22	74	65	27	92	67	28	95	41	17	58
1820	21	3	24	14	3	17	14	3	17	9	2	10
1830	6	1	7	7	2	9	7	2	9	5	0	5
1840	16	0	16	20	0	20	21	0	21	13	0	13
1850	3	2	5	5	2	7	5	2	7	3	1	4
1860	0	0	0	0	0	0	0	0	0	0	0	0
1910	15	2	17	19	2	21	20	2	22	12	1	13

FIGURE VI-1 (Cont'd) SAMPLE OUTPUT OF 'CORRECTION' TO O-D DATA FOR

EMPLOYMENT BY DESTINATION ZONES

EMPLOYMENT BY ZONE 1967

ZONE	1967			U.S. SURVEY		1ST CORRECTION			2ND CORRECTION			CORRECTED PEAK TRIPS		
	MALE	FEMALE	TOTAL	MALES	FEMALES	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
1920	22	1	23	95.65	4.35	27	2	29	28	2	30	17	1	18
1930	27	17	44	61.36	38.64	34	21	55	35	22	57	21	14	35
1940	14	2	16	87.50	12.50	17	3	20	17	4	21	11	2	13
1950	1	0	1	100.00	0.0	1	0	1	1	0	1	1	0	1
1960	1	1	2	50.00	50.00	1	1	2	1	1	2	1	0	1
4111	6	1	7	25.71	14.29	7	2	9	7	2	9	5	0	5
4112	32	4	36	88.89	11.11	40	5	45	41	5	46	25	3	28
4121	199	164	363	54.82	45.18	248	204	452	255	210	465	155	127	282
4122	197	80	287	68.64	31.36	246	112	358	253	115	368	153	70	223
4123	10	0	10	100.00	0.0	12	0	12	12	0	12	7	0	7
4124	24	55	79	24.86	63.04	42	73	115	43	75	118	26	46	72
4131	7	0	7	100.00	0.0	9	0	9	9	0	9	5	0	5
4132	18	2	20	90.00	10.00	22	3	25	23	3	26	14	2	16
4123	275	83	458	81.88	18.12	467	104	571	481	107	588	292	65	357
4141	5	1	6	83.33	16.67	6	1	7	6	1	7	4	0	4
4142	40	32	81	50.40	38.51	61	40	101	62	41	104	38	25	63
4151	6	1	7	85.71	14.29	7	2	9	7	2	9	5	0	5
4411	1	0	1	100.00	0.0	1	0	1	1	0	1	1	0	1
4412	0	0	0	0.0	100.00	0	0	0	0	0	0	0	0	0
4413	1	0	1	100.00	0.0	1	0	1	1	0	1	1	0	1
4414	2	0	2	100.00	0.0	2	0	2	2	0	2	1	0	1
4421	2	2	5	60.00	40.00	4	2	6	4	2	6	2	2	4
4422	115	20	144	79.86	20.14	143	26	179	147	27	184	89	23	112
4421	31	4	35	88.57	11.43	39	5	44	40	5	45	24	3	27
4432	5	0	5	100.00	0.0	6	0	6	6	0	6	4	0	4
4441	98	11	109	89.91	10.09	122	14	136	126	14	140	76	9	85
4442	180	22	202	90.11	10.89	224	28	252	231	28	259	140	17	157
5112	727	80	807	90.09	9.91	906	100	1006	932	103	1035	566	62	628
6022	25	11	40	77.55	22.45	47	14	61	48	15	63	30	8	38
6015	402	138	540	74.44	25.56	501	172	673	516	177	693	313	109	421
6016	207	41	248	83.47	16.53	250	51	309	266	52	318	161	32	193
6028	135	13	148	91.22	8.78	148	16	184	173	16	189	105	10	115

FIGURE VI-1 (cont'd) SAMPLE OUTPUT OF 'CORRECTION' TO O-D DATA FOR EMPLOYMENT BY DESTINATION ZONES

EMPLOYMENT BY ZONE 1967

2010	1967 O-D SURVEY			1st CORRECTION			2ND CORRECTION			CORRECTED PEAK TRIPS		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
2010	1107	416	1523	72.69	27.31	100	1380	518	1898	1420	533	1953
2020	196	165	361	54.55	45.45	100	247	205	452	254	211	465
2110	206	104	310	73.33	26.67	100	356	130	486	366	134	500
2120	165	23	188	87.77	12.23	100	206	28	234	212	29	241
2130	75	34	109	68.81	31.19	100	93	43	136	85	44	129
2140	75	60	135	55.56	44.44	100	93	75	168	96	77	173
2211	2439	1175	3614	67.49	32.51	100	3040	1465	4505	3129	1507	4636
2212	662	1008	1670	37.61	62.39	100	825	1369	2194	849	1409	2258
2220	41	32	73	55.16	43.84	100	51	40	91	52	42	94
2230	60	40	100	60.00	40.00	100	75	50	125	77	52	129
2240	100	68	168	67.57	32.43	100	125	59	184	124	60	184
2250	33	0	42	78.57	21.43	100	41	11	52	42	12	54
2310	04	76	170	55.29	44.71	100	117	95	212	120	98	218
2320	893	362	1255	71.16	28.84	100	1113	451	1564	1145	465	1610
2330	52	32	84	61.90	38.10	100	65	40	105	67	41	108
2340	41	30	71	57.75	42.25	100	51	37	88	52	39	91
2350	642	82	723	88.52	11.48	100	792	103	895	821	106	927
2360	748	173	921	81.22	18.78	100	932	216	1148	959	222	1181
2370	20	18	46	60.67	39.33	100	35	22	57	36	23	59
2410	572	154	726	78.79	21.21	100	713	192	905	734	197	931
2420	70	54	124	56.45	43.55	100	67	68	135	90	70	160
2430	20	9	29	68.97	31.03	100	25	11	36	26	11	37
2440	327	91	418	78.23	21.77	100	408	113	521	420	116	536
2450	20	12	42	71.43	28.57	100	37	15	52	33	16	49
2460	401	95	497	80.68	19.32	100	500	119	619	515	122	637
2470	418	215	633	66.03	33.97	100	521	268	789	536	276	812
2510	40	46	86	46.51	53.49	100	50	57	107	51	59	110
2520	31	38	69	44.93	55.07	100	39	47	86	40	49	89
2530	54	49	103	54.21	45.79	100	72	61	133	74	63	137
2540	157	66	223	70.40	29.60	100	196	92	288	202	84	286
2550	307	310	617	49.76	50.24	100	383	386	769	394	397	791
2560	136	100	236	57.63	42.37	100	170	124	294	175	128	303
2620	105	57	162	64.81	35.19	100	131	71	202	135	73	208
2630	90	45	135	66.67	33.33	100	112	56	168	115	58	173
2640	110	39	149	58.04	41.96	100	142	113	255	152	117	269
2710	117	66	183	63.93	36.07	100	146	82	228	150	85	235
2715	107	121	228	44.96	55.04	100	133	164	297	137	169	306
2720	219	193	412	62.30	37.70	100	398	240	638	410	247	657
2725	102	24	126	89.19	10.81	100	247	30	277	254	31	285
2810	1178	132	1310	89.92	10.08	100	1468	165	1633	1511	170	1681
2820	470	34	504	93.25	6.75	100	586	42	628	603	43	646
2910	20	17	37	54.05	45.95	100	25	21	46	26	21	47
2920	59	18	77	76.62	23.38	100	74	22	96	76	23	99
2930	53	7	60	85.33	14.67	100	66	9	75	68	9	77
2940	62	12	74	82.78	17.22	100	77	15	92	79	16	95
2960	7	5	12	58.33	41.67	100	9	6	15	9	6	15
3010	77	101	178	43.26	56.74	100	96	126	222	99	129	228
3021	49	16	65	75.38	24.62	100	61	20	81	63	20	83
3022	82	54	136	60.29	39.71	100	102	68	170	105	70	175

FIGURE VI-1 (Cont'd) SAMPLE OUTPUT OF 'CORRECTION' TO O-D DATA
EMPLOYMENT BY DESTINATION ZONES

EMPLOYMENT BY ZONE 1967

ZONE	1967			SURVEY			1ST CORRECTION			2ND CORRECTION			CORRECTED PEAK TRIPS		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
3030	25	5	30	33.33	16.67	50.00	31	6	37	32	6	38	19	4	23
3040	61	18	79	77.22	22.78	100.00	76	22	98	78	23	101	47	14	61
3050	72	50	123	59.35	40.65	100.00	91	62	153	94	63	157	57	38	95
3110	6	0	6	100.00	0.0	100.00	7	0	7	7	0	7	4	0	4
3120	0	0	0	0.0	0.0	0.0	11	0	11	11	0	11	7	0	7
3130	0	1	1	88.89	11.11	100.00	10	1	11	10	1	11	6	1	7
3140	2	0	2	100.00	0.0	100.00	2	0	2	2	0	2	1	0	1
3150	0	0	0	0.0	100.00	100.00	0	0	0	0	0	0	0	0	0
3160	1	0	1	100.00	0.0	100.00	1	0	1	1	0	1	1	0	1
4211	0	0	0	0.0	100.00	100.00	0	0	0	0	0	0	0	0	0
4231	20	1	21	95.24	4.76	100.00	25	1	26	26	1	27	16	0	16
4222	16	2	18	88.89	11.11	100.00	20	2	22	21	2	23	12	2	14
4231	504	98	602	85.84	14.16	100.00	740	123	863	762	126	888	463	76	539
4241	483	48	531	90.96	9.04	100.00	602	60	662	620	61	681	376	37	413
4242	253	15	268	95.92	4.08	100.00	440	19	459	453	19	472	275	12	287
4243	321	20	341	94.13	5.87	100.00	400	25	425	412	25	437	250	15	265
4251	36	17	53	67.92	32.08	100.00	45	21	66	46	22	68	28	13	41
4252	46	11	57	80.70	19.30	100.00	57	14	71	59	14	73	36	8	44
4253	1	1	2	50.00	50.00	100.00	1	1	2	1	1	2	1	0	1
4261	40	1	41	97.56	2.44	100.00	50	1	51	51	1	52	31	1	32
4262	52	5	57	91.23	8.77	100.00	65	6	71	67	6	73	40	4	44
4263	12	2	14	85.71	14.29	100.00	15	2	17	15	2	17	9	1	10
4271	156	6	162	96.34	3.66	100.00	197	7	204	202	7	210	123	4	127
4272	276	14	290	95.17	4.83	100.00	344	17	361	354	18	372	215	11	226
4273	245	12	257	95.33	4.67	100.00	305	15	320	314	15	329	190	10	200
4274	310	37	347	89.34	10.66	100.00	386	47	433	397	49	445	242	29	271
4281	400	24	424	94.34	5.66	100.00	499	30	529	514	30	544	312	18	330
4282	11	1	12	91.67	8.33	100.00	14	1	15	14	1	15	8	1	9
4283	46	4	50	92.00	8.00	100.00	60	5	65	62	5	67	38	3	41
4281	2	1	3	66.67	33.33	100.00	2	2	4	2	2	4	2	0	2
4311	7	0	7	100.00	0.0	100.00	9	0	9	9	0	9	5	0	5
4312	20	3	23	90.91	9.09	100.00	37	4	41	38	4	42	23	2	25
4321	24	1	25	96.00	4.00	100.00	30	1	31	31	1	32	19	0	19
4322	4	0	4	100.00	0.0	100.00	5	0	5	5	0	5	3	0	3
5311	274	40	314	87.26	12.74	100.00	342	49	391	352	50	402	213	31	244
7014	74	10	84	88.10	11.90	100.00	92	13	105	95	13	108	58	8	66
7016	286	27	313	91.37	8.63	100.00	356	34	390	366	35	401	222	21	243
7022	213	21	234	91.03	8.97	100.00	265	27	292	273	28	301	166	17	183
	70052	31061	101124				87322	38716	126038	87581	39451	126032	53154	23341	76495

FIGURE VI-1 (Cont'd) SAMPLE OUTPUT OF 'CORRECTION' TO O-D DATA FOR EMPLOYMENT BY DESTINATION ZONES

TABLE VI-2

UNIVERSITY AND NAIT STUDENTS

	<u>University</u>	<u>NAIT</u>	<u>Total</u>		<u>University</u>	<u>NAIT</u>	<u>Total</u>
0010	48	7	55	0310	105	19	124
0020	0	3	3	0320	83	18	101
0030	3	0	3	0330	77	17	94
0040	12	1	13	0340	50	13	63
0050	162	28	190	0410	44	17	61
0060	59	3	62	0420	0	0	0
0070	75	3	78	0430	48	17	65
CBD	359	45	404	0440	86	19	105
0110	21	12	33	0510	59	61	120
0120	27	33	60	0515	0	0	0
0140	27	13	40	0520	42	27	69
0150	24	14	38	0540	64	28	92
0210	88	81	169	0550	17	32	49
0220	57	151	208	0560	46	70	116
0230	117	57	174	600	0	0	0
0240	18	12	30	610	0	0	0
0250	44	47	91	710	34	25	59
0260	47	164	211	720	101	42	143

TABLE VI-2

UNIVERSITY AND NAIT STUDENTS

	<u>University</u>	<u>NAIT</u>	<u>Total</u>		<u>University</u>	<u>NAIT</u>	<u>Total</u>
730	108	32	140	1040	80	9	89
810	77	47	124	1110	22	13	35
820	55	23	78	1120	17	17	34
830	61	23	84	1130	15	5	20
840	14	0	14	1140	6	9	15
850	3	0	3	1150	34	25	59
860	146	30	176	1160	33	29	62
870	147	29	176	1170	29	10	39
880	174	26	200	1180	2	3	5
900	2	0	0	1210	2	0	2
910	113	9	122	1220	2	0	2
920	97	14	111	1230	3	0	3
930	203	24	227	1310	72	46	118
940	156	4	160	1320	46	36	82
960	3	0	3	1330	38	40	78
1010	104	19	123	1340	53	47	100
1020	37	9	46	1410	66	38	104
1030	50	15	65	1420	77	49	126

TABLE VI-2
UNIVERSITY AND NAIT STUDENTS

	<u>University</u>	<u>NAIT</u>	<u>Total</u>
1430	43	34	77
1440	22	17	39
1520	31	41	72
1540	30	19	49
1550	2	1	3
1610	14	10	24
1620	37	27	64
1630	43	21	64
1710	1	0	1
1870	0	6	6
1910	2	1	3
1920	4	2	6
1930	5	14	19

TABLE VI-2

UNIVERSITY AND NAIT STUDENTS

	University	NAIT	Total		University	NAIT	Total
2010	670	25	695	2370	74	9	83
2020	1521	25	1546	2410	73	19	92
2110	320	49	369	2420	65	10	75
2120	38	7	45	2430	60	11	71
2130	79	24	103	2440	96	14	110
2140	69	17	86	2450	28	1	29
2202	0	1	1	2460	49	16	65
2210	1595	0	1595	2470	94	32	126
2220	212	4	216	2510	60	10	70
2230	442	12	454	2520	98	14	112
2240	11	0	11	2530	137	26	163
2250	76	5	81	2540	65	14	79
2310	556	24	580	2550	2	0	2
2320	148	22	170	2610	66	24	90
2330	228	21	249	2620	63	17	80
2340	134	14	148	2630	104	17	121
2350	84	8	92	2640	128	28	156
2360	47	11	58	2710	94	23	117

TABLE VI-2
UNIVERSITY AND NAIT STUDENTS

	<u>University</u>	<u>NAIT</u>	<u>Total</u>		<u>University</u>	<u>NAIT</u>	<u>Total</u>
2720	181	34	215	4131	0	1	1
2730	13	4	17	4132	0	1	1
2810	0	0	0	4133	0	3	3
2820	1	0	1	4241	0	2	2
2910	52	6	58	4250	64	12	76
2920	17	8	25	4291	0	7	7
2940	0	1	1	4422	0	1	1
2950	0	2	2	5112	0	5	5
2960	5	2	7	5400	28	0	28
3010	126	8	134	6010	13	0	13
3020	270	17	287	6300	0	0	0
3030	26	0	26	6500	18	0	18
3040	28	2	30	6700	9	0	9
3050	70	1	71	6900	1	0	1
3110	0	0	0	7300	13	0	13
3120	2	0	2	7400	8	0	8
3130	0	0	0	7500	0	0	0
4111	0	6	6	7800	7	6	13
4120	84	36	120	7900	8	10	18

TABLE VI-2
UNIVERSITY AND NAIT STUDENTS

	<u>University</u>	<u>NAIT</u>	<u>Total</u>
8000	9	18	27
8400	10	4	14
8500	2	13	15
8600	17	22	39
8700	40	16	56
TOTAL	12772	2709	15481

EMPLOYMENT BY ORIGIN (NORTH-SIDE) ZONES (1967)

ORIGIN ZONE	E M P L O Y M E N T			ORIGIN ZONE	E M P L O Y M E N T		
	ORIGINAL	ADJUSTED	ADJUSTED		ORIGINAL	ADJUSTED	ADJUSTED
	<u>O-D</u>	<u>O-D</u>	<u>CBD</u>		<u>O-D</u>	<u>O-D</u>	<u>CBD</u>
0010	501	562	303	0810	1160	1319	330
0020	389	553	332	0820	1248	1251	288
0030				0830	721	854	222
0040				0840	77	241	72
0050	899	872	471	0850	-	-	-
0060	694	714	428	0860	1563	1735	399
0070	414	446	156	0870	436	1948	506
0110	643	999	260	0880	584	1636	491
0120	568	999	180	0910	533	542	249
0130	-	-	-	0920	419	827	232
0140	692	884	239	0930	1629	1892	624
0150	879	924	240	0940	783	944	349
0210	1560	1674	519	0950	-	-	-
0220	896	1059	244	0960	176	41	14
0230	1971	1975	632	1010	1378	2183	568
0240	262	269	73	1015	-	-	-
0250	731	768	184	1020	1260	1258	277
0260	857	880	211	1031	1438	1948	487
0310	1040	1573	551	1032	139	97	24
0320	1069	1169	491	1041	282	573	206
0330	1330	1422	512	1042	251	519	187
0340	602	661	238	1110	629	661	86
0410	592	660	218	1120	944	996	209
0420	-	-	-	1130	785	348	73

TABLE VI-3 cont.

ORIGIN ZONE	E M P L O Y M E N T			ORIGIN ZONE	E M P L O Y M E N T		
	ORIGINAL	ADJUSTED	ADJUSTED		ORIGINAL	ADJUSTED	ADJUSTED
	<u>O-D</u>	<u>O-D</u>	<u>CBD</u>		<u>O-D</u>	<u>O-D</u>	<u>CBD</u>
0430	966	981	265	1140	200	303	55
0440	1101	1099	341	1145	-	-	-
0510	1902	1914	364	1150	858	1136	239
0520	1527	1563	359	1160	1327	1600	304
0530	-	-	-	1170	1107	1138	228
0540	1033	1153	208	1180	80	157	13
0550	712	711	142	1190	78		
0560	1613	1599	368	1210	33	10	1
0610	-	-	-	1220			
0615	-	-	-	1230			
0620	-	-	-	1310	1998	2613	627
0710	731	789	174	1320	1304	1831	385
0720	1369	2434	682	1330	1304	1754	333
0730	1509	1512	454	1340	2025	2129	468
1410	1163	1373	357				
1415	-	-	-				
1421	2006	2333	467				
1431	1692	1932	425				
1440	1019	1265	228				
1510	-	-	-				
1520	2052	2054	349				
1530	-	-	-				
1540	996	1054	221				
1550	76	76	19				
1610	-	-	-				

TABLE VI-3 cont.

ORIGIN ZONE	E M P L O Y M E N T			ORIGIN ZONE	E M P L O Y M E N T		
	ORIGINAL O-D	ADJUSTED O-D	ADJUSTED CBD		ORIGINAL O-D	ADJUSTED O-D	ADJUSTED CBD
1620	1022	1703	341				
1630 }	1579	1573	315				
1710 }							
1720 }	23	39	10				
1810 }							
1820 }							
1830 }							
1840 }							
1850 }							
1860 }							
1910	-	-	-				
1920	858	462	106				
1930 }	431	665	153				
1940 }	212						
1950	-	-	-				
1960	-	-	-				
4121 }	-	2998	630				
4122 }							
4123 }							
4124 }							
NORTH-SIDE TOTAL	70930	84829	22006				

EMPLOYMENT BY ORIGIN (SOUTH-SIDE) ZONES (1967)

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ORIGIN ZONE	E M P L O Y M E N T			ORIGIN ZONE	E M P L O Y M E N T		
	ORIGINAL O-D	ADJUSTED O-D	ADJUSTED CBD		ORIGINAL O-D	ADJUSTED O-D	ADJUSTED CBD
2010	1066	1145	252	2810	-	-	-
2020	698	1250	300	2820	-	-	-
2110	1969	2125	489	2910	200	252	50
2120	335	365	102	2920	145	224	29
2130	709	761	236	2930	66	85	17
2140	469	678	122	2940			
2211	-	-	-	2950	84	-	-
2212	-	-	-	2960	56	68	18
2220	392	503	161	3010	574	914	183
2230	760	973	224	3015	-	-	-
2240	-	-	-	3021	805	923	258
2250	351	399	124	3022	480	737	184
2310	1321	1420	298	3030	215	254	81
2320	414	542	92	3040	721	906	272
2330	1007	1013	253	3050	607	720	230
2340	743	758	159	3110	24	23	5
2350	358	441	71	3120			
2360	797	850	145	3130			
2370	461	630	183	3140			
2410	747	780	125	3150			
2420	1019	1045	219	3160			
2430	649	734	132				
2440	1195	1225	294				
2450	153	447	139				

<u>ORIGIN ZONE</u>	<u>E M P L O Y M E N T</u>		
	<u>ORIGINAL</u>	<u>ADJUSTED</u>	<u>ADJUSTED</u>
	<u>O-D</u>	<u>O-D</u>	<u>CBD</u>
2460	479	1015	203
2470	1681	1445	260
2510	204	701	252
2520	849	948	265
2530	1374	1396	377
2540	645	726	160
2550	-	-	-
2610	1154	1209	302
2620	926	1154	369
2630	1472	1664	506
2640	1886	2364	638
2710	1711	1809	543
2715	-	-	-
2720	3050	3151	756
2730	233	259	31

<u>ORIGIN ZONE</u>	<u>E M P L O Y M E N T</u>		
	<u>ORIGINAL</u>	<u>ADJUSTED</u>	<u>ADJUSTED</u>
	<u>O-D</u>	<u>O-D</u>	<u>CBD</u>
SOUTH- SIDE TOTAL	35254	41127	10183
NORTH- SIDE TOTAL	70930	84829	22006
OVERALL TOTAL	106184	126056	32189
% EMPLOYED IN CBD			25.5%
EMP/POP	27.0%	31.3%	

TABLE VI - 4

ADJUSTED O-D DATA (BASED ON 85% SAMPLE)

<u>Area of Study</u>	<u>Population</u>	<u>% Distribution</u>	<u>Total Employment</u>	<u>Emp/Pop %</u>	<u>CBD Employment</u>	<u>CBC Emp/Total Emp %</u>
1961						
North Side	203,940	68	64,000	31.38	23,714	37.0
South Side	96,080	32	29,905	31.13	8,422	28.2
Total	300,020		93,906	31.30	32,136	34.2
1964						
North Side	227,294	66	72,002	31.68	23,004	31.9
South Side	116,171	34	35,480	30.54	10,964	31.0
Total	343,465		107,482	31.29	33,969	31.6
1967						
North Side	255,479	65	83,447	32.66	22,145	26.5
South Side	137,726	35	41,475	30.11	10,745	25.9
Total	393,205		124,922	31.77	32,890	25.8

CHAPTER VII

APPLICATION OF THE WINNIPEG AREA TRANSPORTATION STUDY (WATS) WORK-TRIP GENERATION AND ATTRACTION EQUATIONS TO THE TRAVEL CHARACTERISTICS OF EDMONTON

The 1962 Winnipeg Area Transportation Study (WATS) developed 2 work-trip production equations which simulated the actually observed travel characteristics of Metropolitan Winnipeg. These equations were applied and compared with the observations made during the 1967 O-D home interview survey and the cordon count of Edmonton to check for applicability. They were tested for CBD as well as the entire city and the correlations for both cases given below. The equations used were as follows (WATS, 1966):

1. Work-trip Generation for the Peak-hour

$$\begin{array}{l} \text{Work-trip Generated at Home} \\ \text{During the Peak-hour in the} \\ \text{Central Zones on Average} \\ \text{Week-day} \end{array} = 0.7347 \times \begin{array}{l} \text{Number of Dwelling} \\ \text{Units} \end{array}$$

2. Work-trip Attraction at Peak-hour

$$\begin{array}{l} \text{Work-trips attracted to the} \\ \text{Work Site During Peak-hour} \\ \text{on an Average Weekday} \end{array} = \begin{array}{l} 0.480 \times \text{Services and Public} \\ \text{Institutional Employ.} \\ + \\ 0.459 \times \text{Warehouses and Manu-} \\ \text{facturing Employment} \\ + \\ 0.500 \times \text{Retail Employment} \\ + \\ 0.952 \times \text{Offices Employment} \end{array}$$

Table VII - 1 shows some of the 'household' information summarized, as well as the employment in the area. It will be observed that there are, on an average, 1.23 persons gainfully employed out of 3.82 persons per household, thus bringing the total employee strength to 126,056. But, only 120,636 were reported to be working within the O-D survey area. The discrepancy of 5,420 work-trips was explained as due to the following reasons:

From O-D data

(i)	Unclassifiable destination somewhere in the City	= 2,969 trips
(ii)	Unknown place of work	= 453 trips
(iii)	Out of town	= <u>1,185 trips</u>
	Total	<u>4,607 trips</u>

If O-D data was based on a 85% sample basis, the "corrected" unaccounted total will be 5,420 worktrips.

TABLE VII - 1

HOUSEHOLD, POPULATION AND EMPLOYMENT OF 1967

Area of Study	1967 Population	ORIGIN DESTINATION SURVEY OF HOUSEHOLDS			EMPLOYMENT IN THE AREA		
		Number of Households	Persons per Household	Employees from this Area	Employees per Household	Employment in this Area	Peak Hour Arrivals Percentage
North Side	255,479	69,709	3.66	84,829	1.27	94,515	51,464 54.45 %
South Side	137,726	33,197	4.17	41,127	1.24	26,120	12,817 49.07 %
Overall	393,205	102,906	3.82	126,056	1.23	120,636	64,280 53.28 %*

* Overall Peak Hour Worktrip Travel Ratio

FIGURE VII - 1

COMPARISON OF THE WINNIPEG AREA TRANSPORTATION WORKTRIP
GENERATION EQUATION FOR PEAK HOUR TO THE CITY OF EDMONTON'S
TRAVEL CHARACTERISTICS DURING THE PEAK HOUR

AREA OF CONSIDERATION: THE ENTIRE CITY OF EDMONTON

<u>R e m a r k s</u>	<u>Calculated</u>		<u>Modification</u>
	<u>Number</u>	<u>Work-Trips</u>	<u>Factor</u>
1. Peak Hour Work-trips Generation Equation			
Based on the Winnipeg Area Transportation Study (WATS)	= 0.7347 x Dwelling Units		
	= 0.7347 x 102,906	= 75,605	
2. Peak Hour Work-trip Generation by Employees from the Overall Area -			
Based on the Established Work-trip Travel Ratio*	= 0.5328* x 126,056	= 67,162	0.888
3. Peak Hour Work-trip Generation by Employment in the Area -			
Based on the CBD Peak-hour Travel Ratio	= 0.607 x 120,636	= 73,226	0.969
4. Peak Hour Work-trip Generation from Overall Area	= 0.607 x 32,189 +		
	0.5328 x 93,867	= 69,551	0.92

* Overall Peak-Hour Work-trip Travel Ratio (Table VII - 1).

Using the Work-trip Generation Equation (from WATS) and multiplying the number of households by the given factor to obtain the generated peak-hour work-trip for the entire city. This equation indicated 75,605 work-trips, however, the percentage of overall work-trip activity observed 67,162 work-trips at peak hour giving a modification factor of 0.888 when compared with the calculated generation trips from WATS. This comparison was also extended to test the recorded employment in the area based on the CBD's Peak-hour travel ratio yielding a correlation of 0.969 for 73,226 work-trips. These calculations are shown in Figure VIII - 1.

FIGURE VII-2

AREA OF CONSIDERATION: Central Business District of Edmonton

Work-Trip attraction equation (from Wats, 1966).

$$\begin{aligned} \text{Work-Trip Attraction} &= 0.480 \times \text{Service \& Public Institutional} \\ \text{at Work-site during} & \quad \text{Employment} \\ & \quad + \\ \text{the peak hour on an} &= 0.459 \times \text{Warehouses \& Manufacturing Employment} \\ & \quad + \\ \text{average week day} &= 0.500 \times \text{Retail Employment} \\ & \quad + \\ &= 0.952 \times \text{Office Employment} \end{aligned}$$

<u>Zone</u>	<u>PEAK-HOUR ATTRACTION</u>	<u>WORK-TRIPS</u>
0010	$= 0.952 \times 6663 + 0.480 \times 6402$ $= 6342 + 3073$	= 9416
0020	$= 0.500 \times 4439 + 0.952 \times 2764$ $+ 0.480 \times 1172$	= 5415
0030	$= 0.459 \times 1112 + 0.952 \times 347$ $510 + 331$	= 841
0040	$= 0.480 \times 1455 + 0.952 \times 1302$ $+ 0.500 \times 1073$ $= 698 + 1240 + 537$	= 2474
0060	$= 0.480 \times 4786$	= <u>2297</u>
	Total	20442

TABLE VII-2

CBD - EMPLOYMENT LAND-USE ATTRACTION (1967)*

<u>Zone</u>	<u>Land-Use Description</u>	<u>%</u>	<u>Employment Constituent</u>	<u>Total Employment</u>
0010	i) Offices	51%	6663	} 13065
	ii) Services	49%	6402	
0020	i) Retail	53%	4439	} 8375
	ii) Offices	33%	2764	
	iii) Services	14%	1172	
0030	i) Warehouses & Wholesale	76%	1112	} 1459
	ii) Offices	24%	347	
0040	i) Services	38%	1455	} 3830
	ii) Offices	34%	1302	
	iii) Retail	28%	1073	
0060	Public Services (Government Centre)		4786	4786
0050 & 0070	Downtown Apartments		(Not considered)	
TOTAL				31515

<u>Peak-Hour Work-Trips</u>			<u>Factor</u>
(1)	Attraction calculated from WATS, 1966	= 20442	1.000
(2)	'Corrected' Cordon Count (Chapter VI)	= 18510	0.905
(3)	'Corrected' Origin-Destination	= 19538	0.956

* Source: Bannon, 1967

The Work-trips Attraction Equation was tested out for the CBD area (Figure VII - 2) and the modification factors showed 0.905 and 0.956 respectively, when compared with the peak-hour activity recorded by the cordon count and the Origin-Destination surveys.

These 2 equations illustrate the relative ease at which peak-hour work-trips and related activity figures for design purposes can be calculated, simplifying and reducing the tremendously large volumes of data collection and calculations that is usually associated with the derivation of such figures.

CHAPTER VII

CONCLUSION AND RECOMMENDATIONS

In 1961 when most of the employment institutions and their related activities were 'clustered' around the Central Business District (CBD), most of the people chose to live close to this region for conveniences of one form or another. Being the 'heart' of the City, the CBD is always the centre of activity and attraction, with tremendous volumes of activities ranging from businesses, shopping and employment to entertainment and sight-seeing. There were no plans for improvement of the street system in this area and many felt that the rate of growth of attraction would drastically impede the smooth flow of traffic. As a result, a form of 'voluntary' decentralization of activities was started.

Between 1961 and 1964, new areas within the city limits were opened up for residential location and shopping centres with other forms of domestic amenities accompanying. Further 'built-up' of 'older' areas were unattractive although there were certain older sections of the downtown regions which were introduced to a phase of urban renewal.

The success of the voluntary decentralization programme can be illustrated by the effect of 1967 CBD employment 'easing-off' although

the overall employment/population percentage of 32% had not been changed over the period of time. In the meantime, the City's population had grown from 276,018 to 393,205 during this period. All zones in the CBD area, with the exception of zone 0010 (on Urban Renewal Programme) showed reductions in employment figures.

From analysis of travel patterns, based on the O-D data, for 1964-1967 period it was observed that it had not undergone through any form of radical changes. Since no major changes were instituted to the street network system, large scale developments of the CBD regions were almost absent except for zone 0010. This served to indicate the 'achievement' of the volutary decentralization.

As there were no other cordon counts made in this area prior to 1967 except for the one conducted by the Metropolitan Edmonton Transportation Study (METS) in 1961, it is quite difficult to assess the exact changes in travel conditions and behaviour. Rhyason (Rhyason, 1967) in his calculations had to allocate more time to north-bound traffic from the south-side as they cross the North Saskatchewan River. He introduced the concept of 'bridge penalty' onto the 1961 auto-travel time for 1964 travel conditions. Even from the 1967 cordon count, a fairly large volume of through traffic was observed in the area, although the proportion was lower during the peak-hour.

Comparison between the 1967 O-D data and the Cordon Count for the CBD yields the following results:

<u>Mode of Transportation</u>	<u>Time Difference between Arrival in CBD and the Starting Time of Work</u>
Transit Patrons	10½ minutes
Auto - Drivers	3 minutes
Auto - Passengers	7½ minutes
Auto - Worktrips	6 minutes
Overall Worktrips	7½ minutes

Assignment of cross-river traffic indicated that "minimum time" could not be used as the only factor determining a traveller's choice of routes. Other factors such as travelling cost, travelling distance, convenience of route, and availability of alternatives en route together with minimum of (left) turns should have been investigated for their waging effects. These should be incorporated in future studies of this nature. Distribution of worktrips based on the "extension" to the Gravity Model would still be applicable.

There were strong quantitative indications suggesting that the O-D information of 1967 only surveyed 85% of the population. Also the sampling error of the other 2 surveys (1961 and 1964) were also consistent pointing out that about the same group of people were not reached during the home-interview surveys.

Usage of Winnipeg Area Transportation Study's (WATS) derived equations and factors for trip generation and attraction in Edmonton revealed that fairly accurate worktrip impositions on a system can

be calculated in a very short time without having to undertake huge projects of data collection.

It is recommended that:

1. A more frequent cordon count in the vicinity of the CBD be implemented in order that the effects of actual changing 'field conditions' may be studied in greater detail.
2. A 15% correction be made to the O-D data to obtain better quantitative representation of actual conditions before design and planning procedures are made (if the O-D data is to be the source information).
3. An additional question be included in the O-D Questionnaire inquiring as to whether a person is a member of a carpool, (and if he is, how many members in the pool). This will facilitate future analysis or simulation of auto-driver (in particular) travel pattern and behaviour.
4. Future assignment of cross-river traffic to include the study of a traveller's choice of routes on his journey to work. Minimum time cannot be used as the only prime determining factor. Other considerations should include among others travelling cost and distance, convenience of route and availability of alternatives en route and minimum of (left) turns.
5. The $7\frac{1}{2}$ minutes of time difference between the arrival in the CBD boundary and the starting time of work be used in the future peak traffic location in this area for work-trips.

6. Factors and equations be derived similar to those of the Winnipeg Area Transportation Study (WATS) and be used for the calculation or the estimation of peak-hour generation or attraction of work-trips. This will reduce the amount of data collection normally associated with this purpose.

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APPENDIX A

EXCERPTS FROM PROGRESS
REPORT BY WALKER AND BAKKER

APPENDIX A

EXCERPTS FROM PROGRESS REPORT OF THE 1964

EMPLOYEE O-D SURVEY BY WALKER AND BAKKER

In this survey all households were interviewed in connection with the civic census in the City, Jasper Place and St. Albert to determine place of work, mode of transportation, what time they started work, etc. In all a 97% sample of employees was obtained. This provides the first opportunity to compare results and verify trends with the 10% sample of employees over 21 taken on the METS survey of 1961

	<u>1964</u>	<u>1961</u>	<u>Change</u>
Total Employees	97,248	Not available	-
Employees over 21	92,315	81,000	+ 14.0 %
Total employees in CBD	29,531	Not available	-
CBD Employees over 21	27,520	27,280	+ 0.5 %
Percentage Employees in CBD	30.4	Not available	-
Percentage Employees in CBD over 21	29.8	33.6	- 3.8 %
CBD Employees using transit	9,808	Not available	-
Percentage CBD Employees using transit	33.0	Not available	-
CBD Employees over 21 using transit	8,600*	8,130	+ 6 %
Percentage CBD Employees over 21 using transit	31.2	29.8	+ 1.4 %
CBD Employees driving	14,368	Not available	-
CBD Employees over 21 driving	13,560*	13,530	-
Percentage CBD Employees over 21 driving	49.3	49.8	-
Non CBD Employees	67,217	Not available	-

	<u>1964</u>	<u>1961</u>	<u>Change</u>
Non CBD Employees over 21	64,795	53,820	+ 20 %
Non CBD Employees using transit	8,563	Not available	-
Non CBD Employees over 21 using transit	Not yet available	7,860	-
Percentage non CBD using transit	12.7	Not available	-
Percentage non CBD over 21 using transit	Not yet available	14.6	-

* It is estimated that 60% of the under 21 to the CBD use transit and that the remainder drive a car.

It should be noted that while the total employment over 21 increased by 14% the equivalent CBD employment increased by only 0.5%. However, transit riding increased by 6% increasing the transit mode split from 29.8 to 31.2%. The driver mode went down from 49.8 to 49.3% (the reduction is probably greater since such modes as car passengers, walk, etc., were not estimated).

It is further to be noted that generally the older areas had a reduction of CBD employees, while the outlying areas had substantial increases; indicating a migration outwards of CBD employees.

APPENDIX B

MINIMUM PATH THEORY AND MOORE'S ALGORITHM

(FROM HALLS' THESIS, 1968)

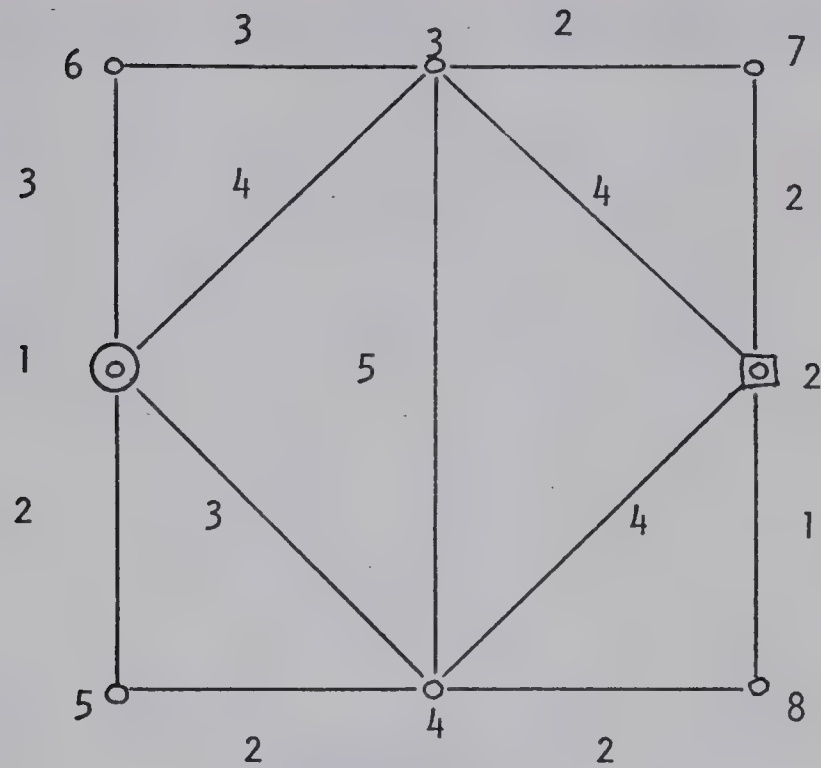
THEORY FROM HALLS' THESIS

1. Minimum Path Trip Assignment

For transportation planning purposes, it is necessary to know the expected path of trips between any two points on the system. It is generally accepted that the best approximation of this path is the minimum time path, or some variation using distance and cost in addition to time. The Moore Algorithm is widely used for this purpose (U.S. Department of Commerce, 1964).

The Moore Algorithm "builds" a minimum path "Tree" from each origin node to each other node in the network. Figure B.1 shows a very simple transportation network. The following description of finding the minimum path from origin to destination is progressively illustrated graphically by Figures B.2, B.3 and B.4 and serve to illustrate the principle of the Moore Algorithm.

FIGURE B-1
SIMPLE TRANSPORTATION NETWORK



1  Origin Centroid

2  Destination Centroid

7  Node

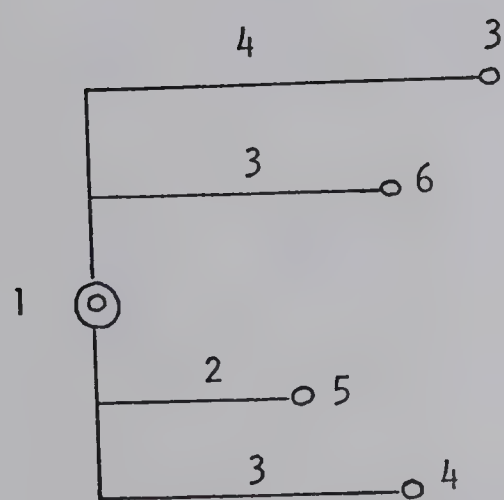
2 Link Time
(All links are two way)

Note: The above convention is used throughout the example.

1. Beginning at 1, record time on all links beginning at Centroid 1.

Link	Time	Cumulative Time
1-6	3	3
1-3	4	4
1-4	3	3
1-5	2	2

FIGURE B-2



2. From each of the nodes now reached, record time on all links that can be reached.

<u>Link</u>	<u>Time</u>	<u>Cum. Time</u>
3-7	2	6
3-2	4	8 x
3-4	5	9 x
3-1	Reverse	
3-6	Reverse	

<u>Link</u>	<u>Time</u>	<u>Cum. Time</u>
6-1	Reverse	
6-3	3	6 x

<u>Link</u>	<u>Time</u>	<u>Cum. Time</u>
5-1	Reverse	
5-4	2	4 x

<u>Link</u>	<u>Time</u>	<u>Cum. Time</u>
4-1	Reverse	
4-5	Reverse	
4-3	5	8 x
4-8	2	5
4-2	4	7

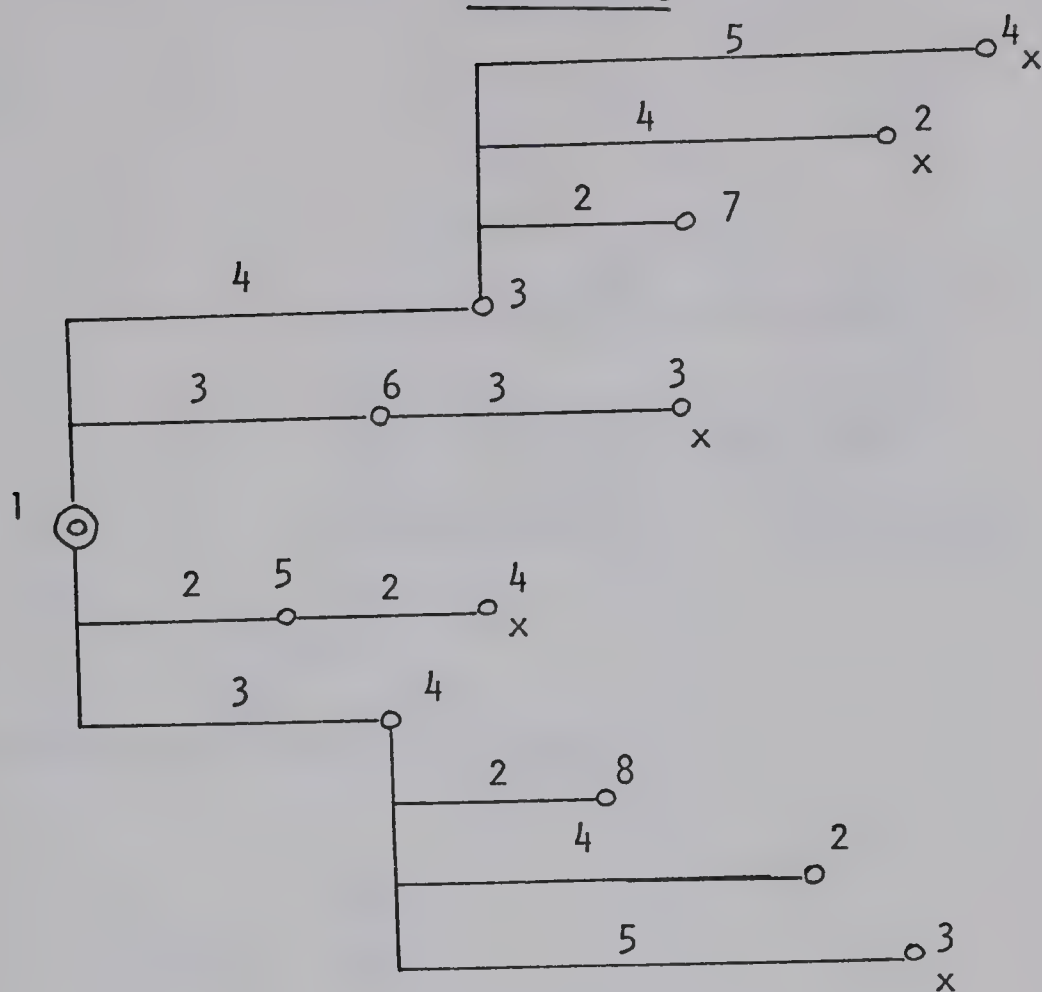
<u>Origin</u>	<u>Node</u>	<u>Min. Cumulative Travel Time</u>
1	3	4
1	5	2
1	4	3
1	6	3

From those nodes left, record time on links that can be reached.

<u>Link</u>	<u>Time</u>	<u>Cum. Time</u>	<u>Link</u>	<u>Time</u>	<u>Cum. Time</u>
2-3	Reverse		7-3	Reverse	
2-7	2	9	7-2	2	8
2-8	1	8			
2-4	Reverse				

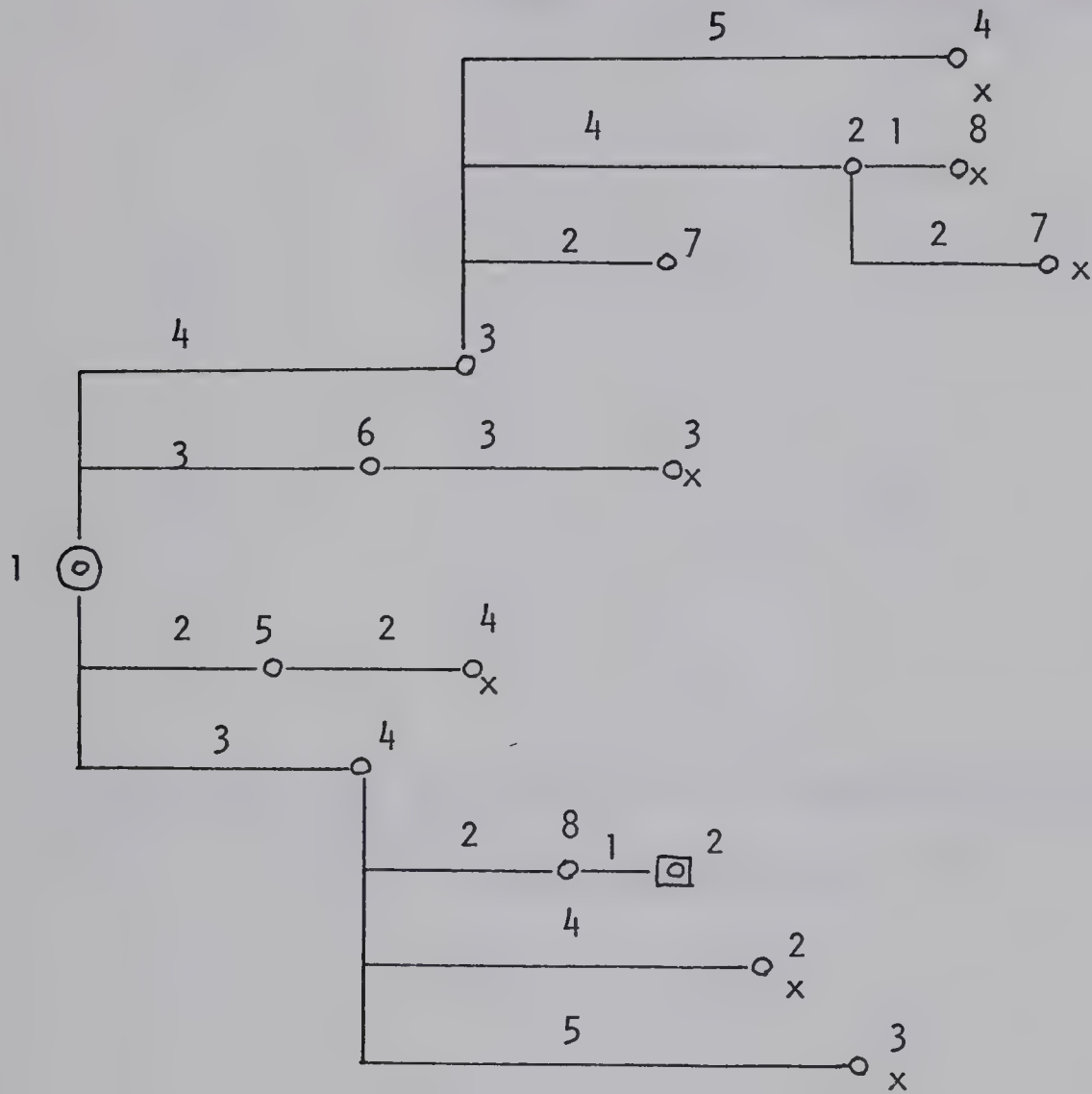
<u>Link</u>	<u>Time</u>	<u>Cum. Time</u>
8-2	1	6
8-4	Reverse	

FIGURE B-3



The Algorithm has now "built" to nodes 2, 7, 8, and through nodes 3, 6, 5, or 4. Consider those nodes which have been built through. Retain the minimum: it is shorter to reach node 3 direct from 1 than via 6 or 4. It is shorter to reach node 4 direct from 1 than via 5.

FIGURE B-4



Considering those nodes which have been built through retain the minimum

<u>Origin</u>	<u>Node</u>	<u>Min. Cumulative Travel Time</u>
1	3	4
1	6	3
1	5	2
1	4	3
1	8	5
1	7	6
1	2	6

4. The minimum path from centroid 1 to destination centroid 2 is via links 1-4; 4-8; 8-2; with minimum time $3 + 2 + 1 = 6$.

APPENDIX C.

INACCURACY OF A SHORT TIME INTERVAL
FOR COMPARISON PURPOSES.

APPENDIX C.

INACCURACY OF A SHORT TIME INTERVAL FOR COMPARISON PURPOSES

The Cordon Count is based on the concept that : -

Inbound Traffic	—	Outbound Traffic	=	Accumulated Traffic
--------------------	---	---------------------	---	------------------------

for a particular time interval. While short time intervals is advantageous in locating peak flows, it also introduces certain errors when used for comparison purposes.

Through traffic could cause errors in the tabulation of volume counts if trips noted as inbound during a particular time interval lapse into the next time interval when departing from the survey area. Two of the following reasons for the generation of errors caused by such trips :-

- 1) An intended through trip is tabulated as CBD-bound at the end of the counting time interval, even though the traveller may still be on his way out of the area.
- 2) When he leaves the survey area during the next time interval there will be an actual displacement of a 'true CBD-bound' trip in the accumulated traffic computation.

The overall effect would be the shifting of a CBD-bound trip from the second time interval in the first. Therefore, direct comparison of traffic volume using the particular time interval would institute

certain 'survey' errors.

However, if the constant time interval variable is increase to a greater time period, errors as above-mentioned could be reduced, since the number of intervals would then be reduced and also the through traffic would be given a chance to 'check' in and out during the same time interval. It should be pointed that about 10 to 12 minutes of travel time is normally required to traverse from one checkpoint of the cordon area to the next during the morning peak period. In other words, this is to say that usage of time interval of less than 12 minutes would generate a substantial number of errors. For the same reasons, the 15 minute intervals (figure C-1) was not considered a satisfactory constant variable to be used for comparing directing with the O-D data.

The bulk of the traffic entering and leaving the CBD area during the period 7:00 to 9:00 am. can be safely assumed to be consisted of work-trips. Beyond that time, other trip-purpose would dominate.

Since the 15 minute interval was not accepted as a good representative constant variable, other time intervals were investigated for possible usage. By process of elimination, the 30 minute interval was chosen. Disadvantages of the others were as follows;-

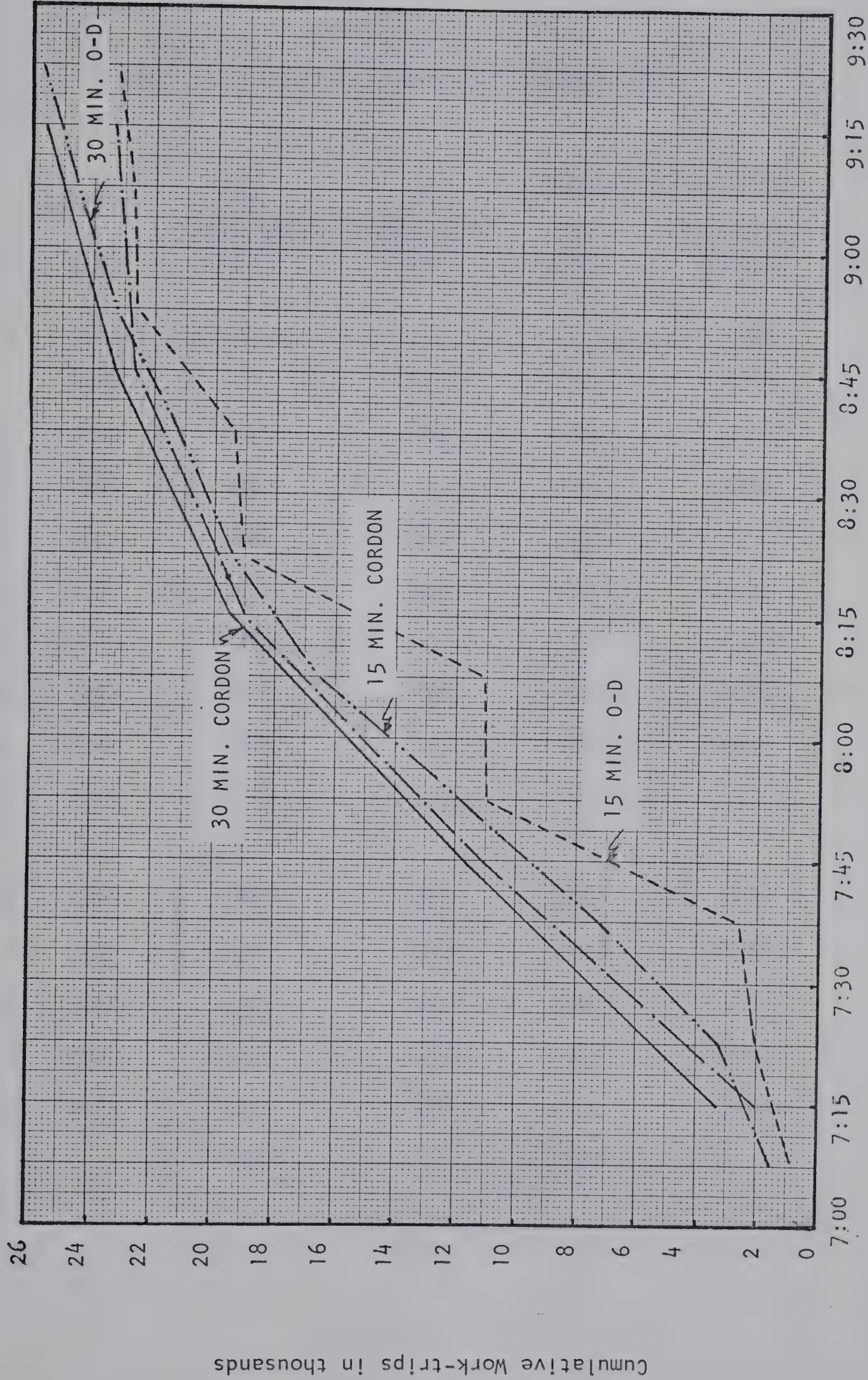
- a) 45 minute intervals - i) this interval is too awkward to be worked with since the period of consideration is 7:00 to 9:00 am. (2 hour period)

ii) the peak hour (7:30-8:30am)
volume would fall between two
intervals.

- b) 60 minute interval -
- i) this would only produce two sets of information for comparison - and is not adequate enough to be representative.
 - ii) Peak hour (7:30-8:30am) volume would fall between two intervals.

Figure. C-2 shows the differences in graphical form between the comparisons with the Origin-Desintation data for 30 minute and 15 minute intervals. For the above reasons the 30 minute interval was favoured to the 15 minute ones.

FIGURE C-2 COMPARISON OF CUMULATIVE WORK-TRIPS OF CORDON COUNT AND 1967 O-D IN 15 AND 30 MINUTE INTERVALS



TIME - (IN THE MORNING PERIOD)

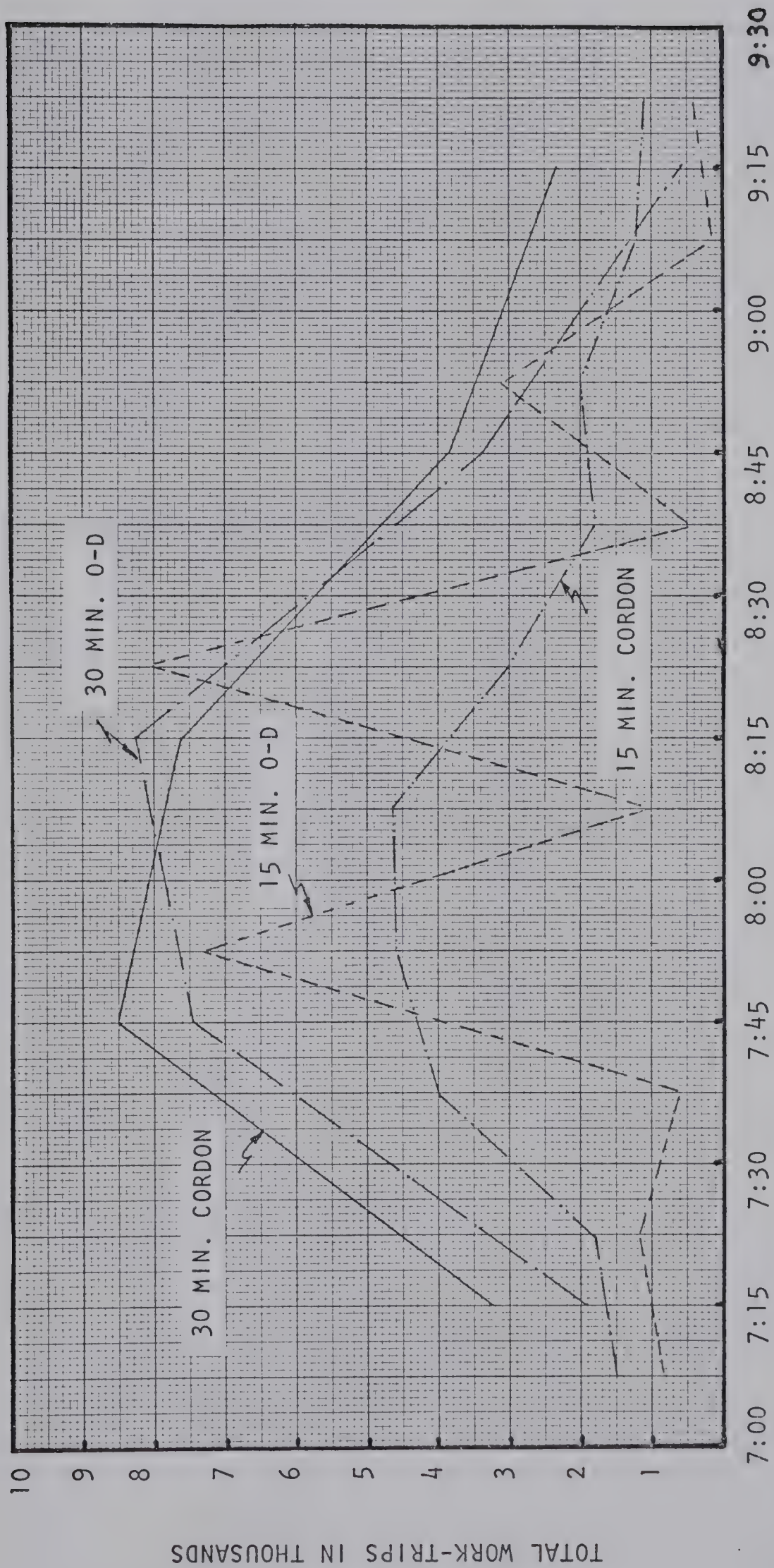
TABLE C-1

TOTAL WORKTRIPS IN 15 AND 30 MIN. INTERVALS

<u>TIME</u>		<u>CORDON ACCUMULATED VOLUME</u>	<u>COUNT CUMULATIVE VOLUME</u>	<u>ORIGIN-DESTINATION</u>	
<u>FROM</u>	<u>TO</u>			<u>NET VOLUME</u>	<u>CUMULATIVE VOLUME</u>
7:00	7:15	1470	1470	838	838
7:15	7:30	1790	3260	1222	2060
7:30	7:45	3936	7196	596	2656
7:45	8:00	4589	11785	7330	10986
8:00	8:15	4653	16438	1031	11017
8:15	8:30	3013	19451	8015	19033
8:30	8:45	1780	21231	403	19436
8:45	9:00	2044	23275	3121	22559
9:00	9:15	1262	24537	191	22750
9:15	9:30	1113	25650	472	23222
7:00	7:30	3260	3260	2060	2060
7:30	8:00	8525	11785	7926	10986
8:00	8:30	7666	19451	9046	19033
8:30	9:00	3824	23275	3524	22559
9:00	9:30	2375	25650	663	23222
		25650		23222	

FIGURE C-1

30 MINUTE INTERVAL O-D AND CORDON COUNT
VERSUS
15 MINUTE INTERVAL O-D AND CORDON COUNT
OF TOTAL WORK-TRIPS



TIME - (IN THE MORNING PERIOD)

APPENDIX D

LISTING OF PROGRAMMES

1964 O-D SURVEY

THIS PROGRAMME WILL LIST OUT THE 1964 C - D SURVEY DATA
 INTEGER TOTIME(120, 11), ZONE(120, 7), DESTN(120, 7, 11), ZTOTAL(12
 0), T93CBD(120), ORIGIN(120), T93T(11, 7), TZONE(7), CBD93T
 -, NETTI(11)

INTEGER PROB

REAL ARRIVE(11)

DATA ARRIVE/7.15, 7.30, 7.45, 8.00, 8.15, 8.30, 8.45, 9.00
 -, 9.15, 9.30, 10.00/, TZONE / 0, 0, 0, 0, 0, 0, 0/

I = 1

PROB = 100

2 READ (5, 10) ORIGIN (I)

10 FORMAT (6X, A4)

IF (I .GE. 108) GO TO 51

READ (5, 12) ((DESTN(I, J, K), J=1, 7), K = 1, 11)

12 FORMAT (7I5, 10(/7I5))

T93CBD (I) = 0

DO 101 J1 = 1, 7

ZONE(I, J1) = 0

DO 102 J2 = 1, 10

ZONE (I, J1) = ZONE(I, J1) + DESTN (I, J1, J2)

TOTIME (I, 11) = 0

TOTIME(I, J2) = 0

DO 103 J3 = 1, 7

TOTIME (I, J2) = TOTIME(I, J2) + DESTN(I, J3, J2)

TOTIME (I, 11) = TOTIME (I, 11) + DESTN (I, J3, 11)

103 CONTINUE

102 CONTINUE

T93CBD (I) = T93CBD(I) + ZONE(I, J1)

101 CONTINUE

ZTOTAL (I) = T93CBD (I) + TOTIME (I, 11)

WRITE (6, 16)

WRITE(6, 13) (ARRIVE(L), (DESTN(I, JA, L), JA=1, 7), TOTIME(I, L), L=1, 10)

13 FORMAT (10(/15X, E4.2, 2X, 'AM.', 5X, 7I6, 4X, I6))

WRITE (6, 14) (ZONE(I, JB), JB = 1, 7), T93CBD(I), T93CBD(I)

14 FORMAT (/10X, 'TOTAL UP TILL'/15X, '9.30 AM.', 5X, 7I6, 4X, I6/
 -75X, I6)

WRITE (6, 15) (DESTN(I, JA, 11), JA = 1, 7), TOTIME(I, 11), ORIGIN(
 -I), ZTOTAL (I)

15 FORMAT (/15X, 'OTHERS', 8X, 7I6, 4X, I6///30X, 'TOTAL FOR ZONE',
 -6X, A4, 20X, I6)

I = I + 1

GO TO 2

51 CBD93T = 0

NETOIL = 0

IK = 1

3 L = 10

WRITE (6, 16)

16 FORMAT (1H1/// 10X, 'BREAKDOWN OF TOTAL TRIPS IN '

- /15X, 'DOWNTOWN EDMONTON'

- /15X, 'UP TILL 9:30 AM.'

- /// 20X, 'DESTINATION ZONES', 18X, 'TOTAL', 2X, 'OVERAL

-L TOTAL'

- /5X, 'ORIGIN', 53X, 'FOR ZONE'

- /5X, 'ZONE', 5X, '0010 0020 0030 0040 0050 0060'

-, '0070')

8 IF (PROB .EQ. 100) GO TO 4

- IF (PROB .EQ. 101) GO TO 9

GO TO 52

9 CONTINUE

DO 114 J4 = 1, 7


```

ZONE(IK, J4) = ZONE(IK, J4) + DESTN(IK, J4, 11)
114 CONTINUE
T93CRD(IK) = T93CRD(IK) + TOTIME(IK, 11)
4 WRITE (6, 17) ORIGIN (IK), (ZONE(IK, JD), JD = 1, 7), T93CRD(IK),
- ZTOTAL(IK)
17 FORMAT (/5X, A4, 3X, 7I6, 15, 112)
DO 104 JE = 1, 7
TZONE(JE) = TZONE(JE) + ZONE(IK, JE)
104 CONTINUE
CRD93T = CRD93T + T93CRD(IK)
NETOTL = NETOTL + ZTOTAL(IK)
IK = IK + 1
L = L + 2
IF (L .GE. 58) GO TO 3
IF (IK .EQ. 1) GO TO 5
GO TO 8
5 WRITE (6, 18) (TZONE(JE), JE = 1, 7), CRD93T, NETOTL
18 FORMAT (///5X, 'TOTAL', 4X, 7I6, 18, 18/1H1)
TOTNET = NETOTL
DO 115 J5 = 1, 7
TZONE(J5) = 0
115 CONTINUE
PROB = PROB + 1
GO TO 51
52 WRITE (6, 19) 1
19 FORMAT (1H1////// 20X, 'THERE ARE ', I6, 10X, 'SETS OF DATAS')
NUPSUM = 0
DO 110 NA = 1, 11
NETT = 0
LINE = 10
DO 109 JC = 1, 7
TOT93(NA, JC) = 0
109 CONTINUE
WRITE (6, 32) ARRIVE (NA)
DO 111 IA = 1, 107
6 LINE = LINE + 2
IF (LINE .LT. 58) GO TO 7
LINE = 10
WRITE (6, 32) ARRIVE (NA)
32 FORMAT (1H1///10X, 'BREAKDOWN OF TOTAL TRIPS IN'
- /15X, 'DOWNTOWN EDMONTON'
- /15X, 'FOR THE TIME ', F5.2, ' (AM.)'
- //20X, 'DESTINATION ZONES', 20X, 'TOTAL'
- /4X, 'ORIGIN', 45X, 'FOR ZONE'
- /5X, 'ZONE', 5X, '0010 0020 0030 0040 0050 0060'
- , ' 0070')
GO TO 6
7 WRITE (6, 21) ORIGIN(IA), (DESTN(IA, JA, NA), JA=1, 7), TOTIME(IA, NA)
21 FORMAT (/5X, A4, 3X, 8I6)
NETT = NETT + TOTIME(IA, NA)
DO 112 JB=1, 7
TOT93(NA, JB) = TOT93(NA, JB) + DESTN(IA, JB, NA)
112 CONTINUE
111 CONTINUE
WRITE (6, 24) (TOT93(NA, JD), JD=1, 7), NETT, ARRIVE (NA)
24 FORMAT (///5X, 'THE TOTAL' /5X, 'TRIPS FOR' /12X, 8I6 /5X, 'THE TIME'
- /4X, F5.2, ' AM.')
NUPSUM = NUPSUM + NETT
NETTL(NA) = NETT
NUPSUM = NUPSUM

```



```

      TETT = NETT
      RATIO1 = TETT/TOLNET
      RATIO2 = UPSUM/TOLNET
      WRITE (6, 23) ARRIVE (NA), RATIO1, ARRIVE(NA), RATIO2
23  FORMAT (///10X, 'THE RATIO OF TRIPS AT', F5.2,
-        /10X, 'AND TOTAL NO. OF TRIPS IS', 20X, F6.4
-        ///
-        /10X, 'AND THE RATIO OF TRIPS UP TILL ', F5.2
-        /10X, 'AND THE TOTAL NO. OF TRIPS IS ', 15X, F6.4)
      CALL O D 64(NA, NETT, RATIO1, RATIO2, NUPSUM, ARRIVE)
110 CONTINUE
      WRITE (6, 16)
      DO 113 NR = 1, 11
      WRITE(6, 26) ARRIVE(NR), (TOT23(NR, JE), JE=1, 7), NETTL(NR)
26  FORMAT (//5X, F7.2, 7I6, 5X, I10)
113 CONTINUE
      STOP
      END

      SUBROUTINE O D 64(NA, NETT, RATIO1, RATIO2, NUPSUM, ARRIVE)
      INTEGER NETTL(11), NSUMP(11), ARRIVE(11)
      REAL RAT 1(11), RAT 2(11)
      IF (NA.GT. 1) GO TO 9
      NE = 0
9  NETTL (NA) = NETT
      NE = NE + NETT
      RAT 1 (NA) = RATIO1
      RAT 2 (NA) = RATIO2
      IF (NA .GE. 10) GO TO 10
      NSUMP (NA) = NUPSUM
      RETURN
10 WRITE (6, 33)
33  FORMAT (1H1///15X, 'SUMMARY OF'
-        /10X, 'BREAKDOWN OF THE O-D SURVEY 1964'
-        /10X, 'FOR THE TOTAL TRIPS IN DOWNTOWN'
-        /10X, 'EDMONTON BY TIME'
-        //5X, 'TIME OF', 8X, 'NO OF TRIPS', 4X, 'RATIO OF', 7X,
-        'NO OF TRIPS', 4X, 'RATIO OF'
-        /5X, 'ARRIVAL', 9X, 'FOR TIME', 4X, 'TRIPS/TOTAL', 5X,
-        'UP TILL TIME', 3X, 'TRIPS/TOTAL')
      DO 20 I = 1, NA
      WRITE (6, 34) ARRIVE(I), NETTL(I), RAT 1(I), NSUMP(I), RAT 2(I)
34  FORMAT (//F10.2, 5X, 2(I10, 5X, F10.5, 5X))
20 CONTINUE
      WRITE (6, 35) NE
35  FORMAT (//40X, I10)
      RETURN
      END

```


LISTING OF STREET NETWORK DECODINGS


```

C      THIS PROGRAMME WILL READ THE CODING OF THE STREET-NETWORK THAT IS
C      STORED ON MAGNETIC TAPE/CARDS AND WILL LIST OUT THE ENTIRE
C      DECODING IN A SUITABLE FORMAT ON A 3-1/2 INCH WIDE PAGE
      DIMENSION LU(2100), LC(2100), LL(2100), TIMLNK(2100), DISLNK(2100),
      SPEED(2100)
      INTEGER MARK1, CONTROL
      DATA MARK1/'TAPF'/
      READ (5, 70) CONTROL, LUH, NHN
70  FORMAT (A4, 216)
      DO 251 J = 1, NHN
      LC(J) = 0
      LU(J) = 0
      LL(J) = 0
      DISLNK(J) = 0.0
      TIMLNK(J) = 0.0
      SPEED(J) = 0.0
251  CONTINUE
      IF (CONTROL .EQ. MARK1) GO TO 240
      K = 5
      GO TO 241
240  K = 3
241  DO 250 JA = 1, LUH
      READ(K, 80) NO, NO, KS, KT, MW, MV, L
80  FORMAT (215, 13, 1X, 11, 17, 1X, 12, 15)
      LC(L) = NO
      LU(L) = NO
      LL(L) = 1
      NT = (10*KS) + KT
      TIMLNK(L) = NT
      NOIST = (100*MW) + MV
      DISLNK(L) = NOIST
      IF (TIMLNK(L).LT.0.0001) GO TO 260
      SPEED(L) = 6*DISLNK(L)/TIMLNK(L)
260  CONTINUE
      TIMLNK(L) = TIMLNK(L)/10.
      DISLNK(L) = DISLNK(L)/100.
250  CONTINUE
      IF (K.EQ.8) REWIND 8
      LTIMES = LUH/100
      LYNN = LUH - LTIMES*100
      LHALVE = LYNN/2
      LTEX = LYNN - LHALVE*2
      IF (LTEX .GT. 0) LHALVE = LHALVE + 1
      M1 = 0
      M2 = 50
      MOUT = 50
      LTIMES = LTIMES + 1
      DO 252 IA = 1, LTIMES
      WRITE(6, 81) IA
81  FORMAT (1H1/72X, 'LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIM
      15' /72X, 'OF THE STREETNETWORK OF THE CITY OF EDMONTON',
      25X, 'PAGE', 13)
      WRITE(6, 82)
82  FORMAT (1/58X, 2('LINK ORIG DEST ', 3('LINK ')) /
      1 /58X, 2(' NO. NODE NODE DIST TIME SPEED ')) / )
      IF (IA .EQ. LTIMES) MOUT = LHALVE
      DO 253 I2 = 1, MOUT

```


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```

M1 = M1 + 1
M2 = M2 + 1
WRITE(6,93) 11(M1),10(M1),10(M1),DISLEN(M1),TIMENK(M1),SPEED(M1),
C      11(M2),10(M2),10(M2),DISLEN(M2),TIMENK(M2),SPEED(M2)
93 FORMAT (56X, 2(316, 16.), 16.1, 16.1, 16.0)
252 CONTINUE
WRITE(6, 94)
94 FORMAT (//90X, 'FIGURE.')
IF (IA .GT. 1) WRITE(6, 95)
95 FORMAT ('+', 95X, '(CONT.)')
M1 = M1 + MULT
IF (IA .EQ. (TIMES-1)) MULT = HALF - 1
M2 = M2 + MULT
253 CONTINUE
WRITE(6, 96)
96 FORMAT (//100X, 'PROGRAMME COMPLETED')
STOP
END

```


PRODUCTION OF CROSS-RIVER
WORK-TRIPS AT THE DESTINATION ZONES


```

C   THIS PROGRAMME WILL CALCULATE THE NUMBER OF WORK-TRIPS ARRIVING
C   AT THE DESTINATION ZONE FROM AN ORIGIN ZONE AND PRODUCE CARDS IN A FORM
C   SUITABLE FOR THE MINIMUM TRIPS PATH PROGRAM FOR THE VARIOUS TIME INTERVALS
    DIMENSION NZONE(200), NDESTN(200), TRATIO(200,12), TRIPS(200),
    - NDEQ1(200), ND(20), NDEQ2(20), WKTRIP(20), CALTRP(20,12), NCALTP
    2(20,12), NTRIPS(12)
    READ(5,11) (NZONE(I), I = 1, 163)
11  FORMAT (20I4)
    WRITE(6, 20)
20  FORMAT (1H1//30X, 'THE CENTROID EQUIVALENT OF ZONES'/
    -/4(5X, 'ZONE   CENTROID')//)
    N1 = 1
    DO 50 I = 1, 41
    N2 = N1 + 3
    IF (I .EQ. 41) N2 = N2 - 1
    WRITE (6, 21) (NZONE(J), J, J = N1, N2)
21  FORMAT (4(I9, I7, 4X))
    N1 = N1 + 4
50  CONTINUE
    IC = 0
33  WRITE (6, 22)
22  FORMAT (1H1//20X, 'THE WORKTRIP TRAVEL AT THE DESTINATION ZONE'/)
    WRITE (6, 23)
23  FORMAT (/2X, 'DESTINATION', 13X, 'RATIO AT THE TIME OF ARRIVAL',
    11X, 17X, 'THE   NUMBER OF'/2X, 'CENT   ZONE', 3X,
    2'7:15  7:30  7:45  8:00  8:15  8:30  8:45  9:00  9:15  9:30  REST
    3 WORKTRIPS'//)
    LINE = 1
31  IC = IC + 1
30  READ(5, 12) NDESTN(IC), (TRATIO(IC, JA), JA=1, 11), TRIPS(IC)
12  FORMAT (I4, 11F5.3, F11.0)
    IF (NDESTN(IC) .LT. 0) GO TO 100
    NDEQ1 (IC) = NDESTN(IC)
    DO 40 JA = 1, 163
    IF (NDESTN(IC) .EQ. NZONE(JA)) GO TO 41
    GO TO 40
41  NDEQ1(IC) = JA
    GO TO 42
40  CONTINUE
    WRITE(6, 24)
24  FORMAT (/30X, 'THERE IS NO CENTROID EQUIVALENT FOR THIS ZONE')
42  WRITE (6, 25) NDEQ1(IC), NDESTN(IC), (TRATIO(IC, JA), JA=1, 11), TRIPS
    1(IC)
25  FORMAT (I6, I7, 2X, 11F6.3, F9.0)
    LINE = LINE + 1
    IF (LINE .GE. 51) GO TO 33
    GO TO 31
100  MLINES = 1
    WRITE (6, 39)
39  FORMAT (1H1//10X, 'CALCULATIONS AS FOLLOWS :')
101  READ (5, 12) N1
    IF (N1 .LT. 0) GO TO 160
    READ (5, 13) (ND(JB), JB = 1, N1)
13  FORMAT (5X, 15I5)
    WRITE (6, 55) N1, (ND(JB), JB = 1, N1)
55  FORMAT (16I6)
    DO 43 JB = 1, N1
    NDEQ2(JB) = ND(JB)
    DO 44 JA = 1, 163
    IF (ND(JB) .EQ. NZONE(JA)) GO TO 45

```



```

      GO TO 44
45 NDEQ2 (JB) = JA
      GO TO 43
44 CONTINUE
43 CONTINUE
150 READ (5, 14) NOORIG, (WKTRIP(JB), JB = 1, N1)
14 FORMAT (15, 15E5.0)
      DO 201 KK = 1, N1
      IF (WKTRIP(KK) .GT. 100) WRITE (6, 14) NOORIG, WKTRIP(KK)
201 CONTINUE
      IF (NOORIG .LT. 0) GO TO 101
      NOEQ = NOORIG
      DO 26 JA = 1, 163
      IF (NOORIG .EQ. NZONE(JA)) GO TO 27
      GO TO 26
27 NOEQ = JA
      GO TO 28
26 CONTINUE
28 CONTINUE
46 DO 48 JC = 1, N1
      TOTRIP = WKTRIP(JC)*10.
      DO 49 JD = 1, 11
      CALTRP(JC,JD) = TOTRIP*TRATIO(NDEQ2(JC),JD)
      NCALTP(JC,JD) = CALTRP(JC,JD)
      NN = CALTRP(JC,JD)
      ANN = NN
      IF ((CALTRP(JC,JD) - ANN) .GE.0.5) NCALTP(JC,JD) = NCALTP(JC,JD)+1
49 CONTINUE
      NTOT = TOTRIP
34 FORMAT (14110, 12E5.0)
      WRITE (4, 35) NOEQ, NDEQ2(JC), (NCALTP(JC,JD), JD=1,11), NTOT
      MTIMES = MTIMES + 1
48 CONTINUE
      GO TO 150
160 WRITE (6, 36) MTIMES
36 FORMAT (11H17/20X, 'THE NUMBER OF CALCULATIONS MADE WAS ', I10)
35 FORMAT (1414)
      NE = 0
      NEGT = -1
      WRITE (4, 60) (NEGT, (NE, K = 1, 13), K1= 1, 5)
      WRITE (6, 60) NEGT, (NE, K = 1, 13)
      REWIND 4
      JACK1 = 9996
      JACK2 = 9997
      JACK3 = 9999
      J = 0
70 J = J + 1
      IF (J .GT. 163) GO TO 76
      WRITE (6, 62) J
62 FORMAT (7/10X, 'DID ORIGIN CENTROID # :', I5)
71 READ (4, 60) NO, ND, (NTRIPS(L), L = 1, 12)
60 FORMAT (1414)
      IF (NO .LT. 0) GO TO 75
      IF (ND .EQ. 1) WRITE (3, 60) NO, ND, (NTRIPS(L), L = 1, 12)
      GO TO 71
75 REWIND 4
      WRITE (3, 60) JACK1, (NE, K = 1, 13)
      WRITE (3, 60) JACK2, (NE, K = 1, 13)
      GO TO 70
76 WRITE (3, 60) JACK3, (NE, K = 1, 13)

```

```
      REWIND 3
78  READ (3, 60) NO, NO, (NTRIPS (L), L = 1, 12)
      WRITE (4, 60) NO, NO, (NTRIPS(L), L = 1, 12)
      IF (NO .EQ. JACK3) GO TO 77
      GO TO 78
77  WRITE (6, 63)
63  FORMAT (//20X, 'TAPE EXCHANGE COMPLETED')
      REWIND 3
      REWIND 4
      STOP
      END
```

REARRANGING AND
THE CHECKING OF NODES


```

C   THIS PROGRAM WILL ARRANGE THE ORIGIN CENTROIDS IN SEQUENCE FOR THE
C   THE ALLOCATION OF LINK NUMBERS.
C   AN ADDITION HERE IS TO CORRECT THE SPEED FROM THE ZONE CENTROIDS
C   TO THE NET-WORK SYSTEM AND REALLOCATE ITS SPEED FROM 20 MPH TO 15 MPH
REAL DIST(2000), SPEED(2000), TIMEX(2000)
INTEGER IORIG(2000), IDESTN(2000)
INTEGER ION(6), IOP(6)
INTEGER ITIMES(2000)
DATA NUM, NUMB/0,1/
READ (5, 700) N, NST, NODE
700 FORMAT (3I10)
NEX = 1
WRITE(6, 501)
501 FORMAT (1H1//5X, 'CARDS WITH SPEEDS OF 0 MPH')
DO 801 I = 1, N
READ (5, 701) IORIG(I), IDESTN(I), DIST(I), SPEED(I)
701 FORMAT (2I5,2F10.0)
ITIMES(I) = 1
IF (IORIG(I).EQ.-1) GO TO 824
IF (DIST(I).LT.0.1 .OR. SPEED(I) .LT. 0.1) GO TO 807
TIMEX(I) = (DIST(I)*0.6)/SPEED(I)
GO TO 921
807 TIMEX(I) = 0.
921 NUM = NUM + 1
801 CONTINUE
824 NDEAD = 0
WRITE (6,705)(I,IORIG(I),IDESTN(I),DIST(I),SPEED(I),I=1,NUM)
705 FORMAT(5(1X,3I5,2F5.0))
825 WRITE (6, 750) NUM
750 FORMAT (1H1//20X, 'THE NUMBER OF SETS OF DATA READ IN WAS ', I10)
827 CONTINUE
IF (NEX .GE. 3) GO TO 45
NUMB = NUMB + 1
IF (NUMB .GE. NUM) GO TO 829
MINX = NUMB - 1
MINORG = IORIG (MINX)
DO 802 IA = NUMB, NUM
IF (IORIG (IA) .LT. MINORG) GO TO 826
GO TO 828
826 MINORG = IORIG (IA)
MINUMB = IA
828 CONTINUE
802 CONTINUE
MITI = ITIMES (MINX)
ITIMES (MINX) = ITIMES(MINUMB)
ITIMES(MINUMB) = MITI
IDESTY = IDESTN ( MINX)
IDESTN (MINX) = IDESTN(MINUMB)
IDESTN(MINUMB) = IDESTY
IORIG (MINUMB) = IORIG(MINX)
IORIG (MINX) = MINORG
DESY = DIST (MINX)
DIST (MINX ) = DIST(MINUMB)
DIST(MINUMB) = DESY
SPEEDY = SPEED(MINX)
SPEED(MINX) = SPEED(MINUMB)
SPEED(MINUMB) = SPEEDY
TIMEXY = TIMEX (MINX)
TIMEX (MINX) = TIMEX (MINUMB)
TIMEX (MINUMB) = TIMEXY

```



```

      GO TO 827
829 II = NST
      WRITE (6, 830) ITIMES(1), IORIG(1), IDESTN(1), DIST(1),
      -TIMEX(1), SPEED(1), II
      NTIM = 1
      DO 803 IB = 2, NUM
      II = II + 1
      IF (IORIG(IB) .EQ. IORIG(IB-1)) GO TO 911
      NODE = NODE + 1
      WRITE (6, 403) NODE
403 FORMAT (60X, 'NODE', I10)
      IF (NTIM .LT. 2) WRITE(6, 88)
      88 FORMAT ('+', 80X, 'POSSIBLE DEAD END - CHECK')
      WRITE (6, 930) ITIMES(IB), IORIG(IB), IDESTN(IB),
      CDIST(IB), TIMEX(IB), SPEED(IB), II
930 FORMAT(/ 5X, 3I5, F10.0, F10.2, F10.0, 15)
      NTIM = 1
      GO TO 803
911 WRITE (6, 830) ITIMES(IB), IORIG(IB), IDESTN(IB),
      CDIST(IB), TIMEX(IB), SPEED(IB), II
830 FORMAT (15X, 3I5, F10.0, F10.2, F10.0, 15)
      NTIM = NTIM + 1
      IF (NTIM .GE. 5) WRITE (6, 837) NTIM
837 FORMAT (80X, 'NO. OF NODES'/85X, 15, 'TO BE CHECKED')
803 CONTINUE
      WRITE (6, 835)
835 FORMAT (80X, 'PRINT - END'/1H1)
729 CONTINUE
      IX = NST
      DO 805 ID = 1, NUM
      IX = IX + 1
      STDIST = DIST(ID)/100.
      DIST(ID) = STDIST
      NSPEED = SPEED (ID)
      WRITE (6, 836) IX, IORIG (ID), IDESTN(ID), NDIST, NSPEED, TIMEX(ID)
836 FORMAT (4X, 14, 1X, 2I5, 1X, 14, 15, F10.2, 2(A4, 5X))
863 FORMAT (2I5, F10.1, F10.2, 15)
      IF (NEX.LT.2) WRITE(7,863) IORIG(ID), IDESTN(ID), TIMEX(ID),
      CDIST(ID), ID
805 CONTINUE
      WRITE (6, 835)
      IF (NEX.LT. 2) GO TO 91
      II = NST
      DO 804 IC = 1, NUM
      II = II + 1
      IF (SPEED(IC) .GT. 19.9 .AND. SPEED(IC) .LT. 20.1) GO TO 831
      GO TO 832
831 WRITE (6, 833) II, IDESTN(IC), IORIG (IC), DIST(IC), SPEED(IC), TIM
      -EX(IC)
833 FORMAT (10X, 3I5, 3F10.1)
      IF (IDESTN(IC) .LT. 105) WRITE(7, 701) IDESTN(IC), IORIG(IC),
      CDIST(IC), DEEPS
      NOT = DIST(IC)
      NSPD = 15
832 CONTINUE
804 CONTINUE
      WRITE (6, 835)
91 CONTINUE
      DO 806 IF = 1, NUM
      INDEX = IORIG(IF)

```

```
      IORIG(IE) = IDESTN(IE)  
      IDESTN(IE) = INDEX  
806  CONTINUE  
      NEX = NEX + 1  
      NODE = 0  
      NUMB = 1  
      GO TO 825  
45  STOP  
END
```

LISTING FOR LINKS, SPEEDS
AND DISTANCES BETWEEN NODES

THIS PROGRAMME WILL READ THE CODING OF THE STREET-NETWORK
THAT IS STORED ON MAGNETIC TAPE/CARDS AND WILL LIST OUT THE
ENTIRE DECODING IN A SUITABLE FORMAT ON A 8-1/2 INCH WIDE
PAGE

DIMENSION LU(2100), LC(2100), LL(2100), TIMLNK(2100),
-DISLNK(2100),
ISPEED(2100)

INTEGER MARK1, CONTRL

DATA MARK1/'TAPE'/

READ (5, 79) CONTROL, LHN, NHN

79 FORMAT (A4, 216)

DO 251 J = 1, NHN

LC(J) = 0

LU(J) = 0

LL(J) = 0

DISLNK(J) = 0.0

TIMINK (J) = 0.0

SPEED (J) = 0.0

251 CONTINUE

IF (CONTROL .EQ. MARK1) GO TO 240

K = 5

GO TO 241

240 K = 8

241 DO 250 JA = 1, LHN

READ(K,80) NO, ND, KS, KT, MW, MV, L

80 FORMAT (215, 18, 1X, 11, 17, 1X, 12, 15)

LC(L) = NO

LU(L) = ND

IL(I) = 1

NT = (10*KS) + KT

TIMLNK(L) = NT

NDIST = (100*MW) + MV

DISLNK(L) = NDIST

IF (TIMLNK(L).LT.0.0001) GO TO 261

SPEED(I) = 6*DISLNK(I)/TTMINK(I)

260 CONTINUE

TIMLNK(L) = TIMLNK(L)/10.

DISLNK(L) = DISLNK(L)/100.

250 CONTINUE

IF (K.EQ.8) REWIND 8

LTIMES = LHN/100

LYNN = LHN - LTIMES*100

LHALVE = LYNN/2

LTFX = LYNN - LHALVE*2

IF (LTEX .GT. 0) LHALVE = LHALVE + 1

M1 = 0

M2 = 50


```

MULT = 50
LTIMES = LTIMES + 1
DO 252 IA = 1, LTIMES
WRITE(6, 81) IA
81  FORMAT (1H1/72X, 'LISTING OF NODES, LINKS, SPEED, DISTANCE
= AND TIME' /72X, 'OF THE STREETNETWORK OF THE CITY OF
- EDMONTON',
25X, 'PAGE', 13)
WRITE(6, 82)
82  FORMAT (/58X, 2('LINK ORIG DEST', 3('LINK ')))/
1      58X, 2(' NO. NODE NODE DIST TIME SPEED ')/ )
IF (IA .EQ. LTIMES ) MULT = LHALVE
DO 253 IB = 1, MULT
M1 = M1 + 1
M2 = M2 + 1
WRITE(6,83) LL(M1),LC(M1),LU(M1),DISLNK(M1),TIMLNK(M1),
- SPEED(M1), LL(M2),LC(M2),LU(M2),DISLNK(M2),SPEED(M2)
83  FORMAT (56X, 2(316, F6.2, F6.1, F6.0))
253  CONTINUE
WRITE(6, 84)
84  FORMAT (//80X, 'FIGURE.')
IF (IA .GT. L) WRITE(6, 85)
85  FORMAT ('+', 95X, '(CONT.)')
M1 = M1 + MULT
IF (IA .EQ. (LTIMES-1)) MULT = LHALVE - 1
M2 = M2 + MULT
252  CONTINUE
WRITE(6, 86)
86  FORMAT (//100X, 'PROGRAMME COMPLETED')
STOP
END

```


TREE BUILDER PROGRAMME


```

C   THIS PROGRAMME BUILDS MINIMUM PATH TREES FROM AN ORIGIN NODE TO
C   ALL GIVEN NODES IN NETWORK AS DESTINATIONS
C   ALLOWANCE IS MADE FOR GAPS IN NODE AND/OR LINK NUMBER SEQUENCE
C   TRIP COST FUNCTION TO BE MINIMISED MAY BE TRIP TIME, TRIP DISTANCE
C   OR A COMBINATION OF TRIP TIME AND DISTANCE
C   PROGRAMME OUTPUT MAY BE A LISTING AND/OR MAGNETIC TAPE GIVING FOR
C   EACH ORIGIN NODE TO EVERY NETWORK NODE AS DESTINATIONS THE TOTAL
C   TRIP COST AND LAST APPROACH LINK TRAVELLED
C   PROGRAMME IS WRITTEN SO THAT IT MAY BE INTERRUPTED
C   SEE PROGRAMME DESCRIPTION FOR DEFINITION OF VARIABLES USED
C   DIMENSION KD(2100),LC(2100),LL(2100),LU(2100),LT(2100),
1   LCF(2100,4),LND(2100,4),LPT(2100,4),LMA(2100),MN(2100),KAB(2100),
2   LMW(2100),MUZ(2100)
   READ (5,1) LNK,NOR,NOD,LET,LED,NOC,NPR,NTA,NHN,LHN,KZA
   WRITE(6,113) LNK,NOR,NOD,LET,LED,NOC,NPR,NTA,NHN,LHN,KZA
1   FORMAT (18I4)
113  FORMAT (2X, 'READ:', 2X, 18I4)
   DO 2 I=1,NHN
   MN(I)=0
   LMA(I)=0
   LC(I)=0
   DO 3 K=1,4
   LCF(I,K)=0
   LND(I,K)=0
   LPT(I,K)=0
3   CONTINUE
2   CONTINUE
   IF (NOC-1)5,6,6
5   DO 7 J=1,LNK
   READ (8,80) NO,ND,KS,KT,MW,MV,L
80  FORMAT(2I5,18,1X,11,17,1X,12,15)
   LT(L)=(10*KS)+KT
   LL(L)=(100*MW)+MV
   IF (LC(NO)-1)46,47,47
46  KZA=KZA+1
   LMA(KZA)=NO
47  LC(NO)=LC(NO)+1
   K=LC(NO)
   LND(NO,K)=NO
   LPT(NO,K)=1
   LCF(NO,K)=((LET*LT(L))/600)+((LED*LL(L))/100)
7   CONTINUE
   REWIND 8
   WRITE(6,123) KZA
123  FORMAT (2X, 'THE VALUE OF KZA IS', 16)
   DO 8 JJ=1,KZA
   I=LMA(JJ)
   WRITE (3) I,LC(I),(LND(I,K),LPT(I,K),LCF(I,K),K=1,4)
8   CONTINUE
   GO TO 165
6   DO 10 JJ=1,KZA
   READ (3) I,LC(I),(LND(I,K),LPT(I,K),LCF(I,K),K=1,4)
10  CONTINUE
   DO 11 I=1,NOC
   READ(3)NNT,JW,(KAB(JJ),LT(JJ),LMA(JJ),JJ=1,JW)
11  CONTINUE
165  READ(5,1)NCD
   WRITE(6,113) NCD
   READ(5,1)(KAB(JJ),JJ=1,NCD)
   WRITE(6,113) (KAB(JJ),JJ=1,NCD)

```



```

DO 48 JJ=1,NCD
JV=KAB(JJ)
MN(JV)=2
48 CONTINUE
IPAGE=1
LINES=0
WRITE(6,101)IPAGE
101 FORMAT(1H1,10X,
1'MINIMUM PATH TYPES - 1967 EDMONTON STREET NETWORK',
250X,'PAGE',I5/)
9 DO 12 J=1,LHN
LL(J)=0
LT(J)=0
12 CONTINUE
DO 13 I=1,NHN
LMW(I)=0
KAB(I)=0
LMA(I)=0
KD(I)=0
LU(I)=0
MUZ(I)=0
13 CONTINUE
KP=0
READ(5,82)NNT
82 FORMAT (I4)
WRITE(6, 113) NNT
IF(NNT-9998)81,15,16
81 CONTINUE
MM=LC(NNT)
KD(NNT)=2
TEST=999999
DO 17 K=1,MM
NN=LND(NNT,K)
LL(NN)=LCF(NNT,K)
KD(NN)=1
KP=KP+1
LMW(KP)=NN
LU(NN)=LPT(NNT,K)
IF (TEST-LL(NN))17,17,18
18 TEST=LL(NN)
NSF=NN
17 CONTINUE
LG=0
35 MM=LC(NSF)
DO 72 I=1,KP
IF (LMW(I)-NSF)72,71,72
71 MZ=I+1
IF(MZ.GT.KP) GO TO 200
GO TO 73
72 CONTINUE
73 DO 74 J=MZ,KP
II=J-1
LMW(II)=LMW(J)
74 CONTINUE
200 KP=KP-1
DO 25 K=1,MM
NN=LND(NSF,K)
IF(KD(NN)-1)26,27,25
26 LT(NN)=LL(NSF)+LCF(NSF,K)
GO TO 28

```



```

27 LT(NN)=LL(NSF)+LCF(NSF,K)
   IF (LL(NN)-LT(NN))25,29,28
28 LL(NN)=LT(NN)
   KD(NN)=1
   KP=KP+1
   LMW(KP)=NN
   LU(NN)=LPT(NSF,K)
   GO TO 25
29 CONTINUE
24 FORMAT (3(1X,I4))
25 CONTINUE
   KD(NSF)=2
   IF (MN(NSF)-1)50,50,51
51 IF (MUZ(NSF)-1)91,91,50
91 LG=LG+1
   MUZ(NSF)=2
   IF (LG-NCD)50,20,20
50 TEST=999999
   IF (KP.LT.0)GO TO 20
   DO 32 I=1,KP
   I=LMW(I)
   IF (TEST-LL(I))32,32,60
60 IF (LC(I)-1)61,34,34
61 KD(I)=2
   IF (MN(I)-1)32,32,62
62 LG=LG+1
   IF (LG-NCD)32,20,20
34 TEST=LL(I)
   NSF=I
32 CONTINUE
   GO TO 35
20 DO 52 I=1,NHN
   KAB(I)=0
   LMA(I)=0
   LT(I)=0
52 CONTINUE
   JW=0
   DO 53 JJ=1,NHN
   IF (KD(JJ)-1)53,53,54
54 JW=JW+1
   KAB(JW)=JJ
   LT(JW)=LL(JJ)
   LMA(JW)=LU(JJ)
53 CONTINUE
100 CONTINUE
37 IF (NTA-2)40,41,40
41 WRITE (3) NNT,JW,(KAB(JJ),LT(JJ),LMA(JJ),JJ=1,JW)
   WRITE(6,133) NNT
133 FORMAT (2X, 'WROTE ON TAPE - CENTROID:', I5)
40 NOC=NOC+1
   GO TO 2
15 WRITE (6,43)
43 FORMAT (22H PROGRAMME INTERRUPTED)
   GO TO 22
16 WRITE (6,45)
45 FORMAT (20H PROGRAMME COMPLETED)
22 WRITE (6,1) LNK,NOR,NOD,LET,LED,NOC,NPR,NTA,NUN,LEN,KZA
   REWIND 3
   DO 251 J = 1, NHN
   LU(J) = 0

```



```

      LC(J) = 0
      LI(J) = 0
251 CONTINUE
      DO 250 JA = 1, LNK
      READ (8, 80) NO, NO, KS, KT, MW, MV, L
      LC(L) = NO
      LU(L) = NO
      LL(L) = L
250 CONTINUE
      REWIND 8
      M1 = 0
      DO 254 J2 = 1, 5
      M2 = M1 + 50
      M3 = M2 + 50
      M4 = M3 + 50
      M5 = M4 + 50
      M6 = M5 + 50
      M7 = M6 + 50
      WRITE (6, 275)
275 FORMAT (1H1 /60X, 'ORIGIN, DESTINATION AND LINK NUMBER'//
-2X, 7('LINK ORIG DEST ')/)
      DO 253 J1 = 1, 50
      M1 = M1 + 1
      M2 = M2 + 1
      M3 = M3 + 1
      M4 = M4 + 1
      M5 = M5 + 1
      M6 = M6 + 1
      M7 = M7 + 1
      WRITE(6, 276) (LL(M1), LC(M1), LU(M1),
-                  LL(M2), LC(M2), LU(M2),
-                  LL(M3), LC(M3), LU(M3),
-                  LL(M4), LC(M4), LU(M4),
-                  LL(M5), LC(M5), LU(M5),
-                  LL(M6), LC(M6), LU(M6),
-                  LL(M7), LC(M7), LU(M7))
276 FORMAT (2X, 21(14, 2X))
253 CONTINUE
      M1 = M1 + 300
254 CONTINUE
      WRITE(6, 275)
      WRITE(6, 278) (LL(MM), LC(MM), LU(MM), MM = 1751, 1893)
278 FORMAT (1X, 21(1X, 14, 1X))
      STOP
      END

```


MINIMUM PATH TRIP PROGRAMME

C THIS PROGRAMME IDENTIFIES LINKS TRAVELLED VIA MINIMUM PATH TREE
 C FROM AN ORIGIN NODE TO A DESTINATION NODE IN NETWORK, LOADS LINKS,
 C AND CALCULATES TOTAL TRAVEL COST, TRAVEL DISTANCE AND TRAVEL TIME
 C FOR ANY GIVEN NETWORK AND TRIP INTERCHANGE PATTERN
 C PROGRAMME INPUT IS MAGNETIC TAPE AND OUTPUT MAY BE A LISTING AND/
 C OR PUNCHED CARDS

C PROGRAMME IS WRITTEN SO THAT IT MAY BE INTERRUPTED
 C SEE PROGRAMME DESCRIPTION FOR DEFINITION OF VARIABLES USED
 DIMENSION LQ(5,5),LL(2100),LT(2100),LU(2100),LV(2100),LW(2100),
 LNO(2100),NTL(2100),LMA(2100),LVR(2100),LXD(2100),LXT(2100),
 2XT(2020),XD(2020)

INTEGER NBRDGE(12)/' GEO','AT ','HIGH',' LVL','105 ','ST. ','LOW
 1 ','LEVEL',' DAW','SON ','PEVE','RLY '/,
 2NDIRN(2)/' SOU',' NOR'/

INTEGER NORIGN(12)/2000,2001,994,2003,2010,2011,2004,2005,2006,2007,
 -7,2008,2009/,NDESTN(12)/2001,2000,2003,994,2011,2010,2005,2004,200
 -7,2006,2009,2008/,LNKBRD(12)/1856,1857,1361,1861,1878,1880,1865,18
 -68,10,1871,1872,1875/, LDBRDG(12)

DIMENSION NTMM(12)
 REAL TIME(12)/'7:15','7:30','7:45','8:00','8:15','8:30','8:45','9:
 100','9:15','9:30','REST','NETT'/

READ(5,1) LNK,NOD,NPR,NPD,NOC,NOR,NOD,NTT,NTC,LHN,NHN,NPW,NPZ

1 FORMAT (5I4,4I10,2I4,2I2)

READ (5, 6) NDATA

IF (NDATA - 2) 216, 218, 218

216 CONTINUE

READ(5, 6) NTD, NTD, (NTMM(I), I = 1, 12)

WRITE(4, 6) NTD, NTD, (NTMM(I), I = 1, 12)

6 FORMAT (14I4)

IF (NTD.EQ.9999) GO TO 217

GO TO 216

217 CONTINUE

REWIND 4

218 DO 2 J=1, LNK

READ(8,80) N,ND,KS,KT,MW,MV,L

80 FORMAT(2I5,18,1X,11,17,1X,12,15)

LT(I)=(10*KS)+KT

LI(L)=(100*MW)+MV

NO(L)=N

2 CONTINUE

REWIND 8

NTIMES = 15

MULTPL = 1

221 IF (MULTPL .GT. 2) GO TO 222

DO 220 ING = 1, 12, MULTPL

NDD = 0

NTT = 0

NTC = 0

DO 40 J=1,NOD

READ(3) I,LC,(LQ(I,K),LO(2,K),LQ(3,K),K=1,4)

40 CONTINUE

DO 5 I=1,LHN

NTL(I)=0

LMA(I)=0

LVR(I)=0

5 CONTINUE

IF (NOB-1) 3,4,4

4 READ (5,29) KU

READ (5,29) (J,NTL(J),JJ=1,KU)

29 FORMAT (6(1X,14,17))


```

      IF (NOC-1)3,39,39
39 DO 36 I=1,NOC
      READ (3) NNT,JW,(NN,LW(NN),LU(NN),JJ=1,JW)
36 CONTINUE
      3 READ (3) NNT,JW,(NN,LW(NN),LU(NN),JJ=1,JW)
      ICTR=50
12 READ(4,6) NTO, NTD,(NTMM(I), I=1, 12)
      IF (MULTPL .GT. 1) GO TO 223
      GO TO 224
223 IF (ING .GT. 10) GO TO 224
      NTM = NTMM(ING) + NTMM(ING+1)
      GO TO 225
224 NTM = NTMM(ING)
225 CONTINUE
      NPXD=0
      NPXT=0
      DO 7 I=1,2100
      LV(I)=0
7 CONTINUE
      MM=NTD
      KK=0
      IF (NTO-NNT)8,9,10
8 WRITE (6,11)
11 FORMAT(' NTO NTD NIM TRIP CARD OUT OF SEQUENCE')
      WRITE (6,6) NTO,NTD,NTM
      GO TO 12
10 IF (NTO-9997)38,13,14
13 NOC=NOC+1
      GO TO 12
38 IF (NTO-9995)18,8,3
14 IF (NTO-9999)15,16,16
15 WRITE (6,17)
17 FORMAT(1H1,1X,'PROGRAM INTERRUPTED')
      GO TO 18
16 WRITE (6,19)
19 FORMAT(20H PROGRAMME COMPLETED)
      GO TO 18
9 KK=KK+1
      MP=LU(MM)
      LV(KK)=LU(MM)
      LXD(KK)=LL(MP)
      LXT(KK)=LT(MP)
      NPXD=NPXD+LL(MP)
      A=NPXD
      PXD=A/100.
      NPXT=NPXT+LT(MP)
      B=NPXT
      PXT=B/10.
      NDD=NDD+(NTM*LL(MP))
      NTT=NTT+(NTM*LT(MP))
      NTL(MP)=NTL(MP)+NTM
      MM=NO(MP)
      IF (MM-NTO)9,20,9
20 NTC=NTC+(NTM*LW(NTO))
      IF (NPR-2)22,21,22
21 IF (ICTR.LT.50) GO TO 87
23 FORMAT(1H1,/,5X,'1967 EDMONTON ROAD NETWORK - TRIP PATH ',/)
      WRITE(6,23)
      WRITE(6,81)
81 FORMAT(1X,'ORIGIN DEST. NO OF TRIP TRIP ',5X,

```



```

13('----LINK----- ',2X)/)
WRITE(6,24)
24 FORMAT(1X,'CENT. CENT. LINKS TIME LENGTH ',5X,
13('NO. TIME DIST ',1,7/))
ICTR=0
87 WRITE(6,25)NTD,NTD,KK,PXT,PXD
25 FORMAT(1X,14,2I7,F6.1,F6.2)
DO 101 K=1,KK
XX=LXT(K)
ZZ=LXD(K)
XT(K)=XX/10.
XD(K)=ZZ/100.
101 CONTINUE
WRITE(6,82)(LV(K),XT(K),XD(K),K=1,KK)
82 FORMAT(37X,14,F5.1,F5.2,2X,14,F5.1,F5.2,2X,14,F5.1,F5.2)
22 IF (NPU-2)27,26,27
26 WRITE(7,28)NTD,NTD,KK,NPXT,NPXD
28 FORMAT(1X,13,14,3I8)
WRITE(7,85)(LV(K),LXT(K),LXD(K),K=1,KK)
85 FORMAT(15I5)
27 NOB=NOB+1
GO TO 12
18 IF (NPZ-2)31,30,31
30 WRITE(6,32)
32 FORMAT(1H1,5X,'1967 EDMONTON ROAD NETWORK',
15X,'LOADED FOR TRIPS FROM ALL ORIGINS TO DESTINATIONS ',
2'ACROSS THE RIVER'//)
IF (MULTPL.GT.1 .AND. ING.LT.10) GO TO 229
WRITE(6,61) TIME(ING),NTIMES
61 FORMAT ( 20X, 'FOR THE TIME',3X, A4, ' AM.', 3X, 'AT', 14, ' MIN.
1INTERVAL'//)
GO TO 230
229 WRITE(6,61) TIME (ING+1), NTIMES
230 CONTINUE
WRITE(6,83)
83 FORMAT(2X,8('---LINK--',5X))
WRITE(6,84)
84 FORMAT(2X,8('NO. TRIPS',5X)/)
KU=0
NTRIP = 0
NLVB = 0
DO 240 JA = 1, 12
240 LDBRDG(JA) = 0
DO 41 J=1,LHN
IF (NTL(J)-1)41,42,42
42 KU=KU+1
LMA(KU)=J
LVB(KU) = NTL(J)/10.
IF ((NTL(J) - LVB(KU)*10) - 5) 241, 242, 242
242 LVB(KU) = LVB(KU) + 1
241 CONTINUE
NTRIP = NTRIP + NTL(J)
NLVB = NLVB + LVB(KU)
DO 231 JA = 1, 12
IF (LMA(KU).EQ.LNKBRD(JA)) LDBRDG(JA) = LVB(KU)
231 CONTINUE
41 CONTINUE
WRITE (6,33) (LMA(J),LVB(J),J=1,KU)
33 FORMAT(8(1X,14,I6,3X))
NTRIP = NTRIP/10

```

```

      WRITE(6, 66) NTRIP, NLVP
66  FORMAT (//20X, 'THE TOTAL NO. OF TRIPS IS ', I6/
      -/20X, 'THE TOTAL ADJUSTED NO. IS ', I6)
31  IF(NPW-2)35,34,35
34  WRITE (7,29) KU
      WRITE (7,29) (LMA(J),LVB(J),J=1,KU)
35  WRITE(6,89)
89  FORMAT(1H1)
      WRITE(6,311) LNK,NOD,NPR,NPU,NOC,NOR,NDD,NTT,NTC,LHN,NHN,NPW,NPZ
311 FORMAT (2X,5I4,4I10,2I4,2I2)
      WRITE (7,1) LNK,NOD,NPR,NPU,NOC,NOR,NDD,NTT,NTC,LHN,NHN,NPW,NPZ
      REWIND 3
      REWIND 4
      NOR = 0
      NOC = 0
      IF(MULTPL.GT. 1) GO TO 235
      WRITE(6, 64)
64  FORMAT (1H1//10X, 'SUMMARY OF TRAFFIC LOADING ON BRIDGES OF CROSSI
      -NG')
      WRITE(6, 65) TIME(ING), NTIMES
65  FORMAT (20X, 'TIME OF STUDY IS ', A4, ' AM, ', A1, ' I4, ' MIN. INT
      -ERVAL')
      WRITE(6, 63)
63  FORMAT (//5X, 'BRIDGE LINK ORIG DEST DIRECTION VEHICLE'
      -/6X, 'NAME', 5X, 'NO. NODE NODE OF TRAVEL LOADING')
      ND1 = 1
      ND = 1
      NB1 = 1
      NB2 = 2
      J1 = 1
233 WRITE(6, 67) NBRIDGE(NB1),NBRIDGE(NB2),LNKBRD(J1),NORIGN(J1),NDESTN(
      -J1),NDIRN(ND1),LDBRDRG(J1)
67  FORMAT (//4X, 2A4, 2X, I4, 2(3X, I4), 2X, A4, 'IHBOUND', 4X, I4)
      ND1 = (ND - (ND/2)*2)
      IF (ND1.GT. 0) GO TO 236
      ND1 = 1
      NB1 = NB1 + 2
      NB2 = NB2 + 2
      IF (NB1.GE.12.OR.NB2.GT.12) GO TO 232
      GO TO 234
236 ND1 = 2
234 J1 = J1 + 1
      ND = ND + 1
      GO TO 233
232 CONTINUE
235 CONTINUE
220 CONTINUE
      NTIMES = NTIMES + 15
      MULTPL = MULTPL + 1
      GO TO 221
222 STOP
      END

```

CALCULATION OF ZONAL
ARRIVAL OF WORKTRIPS


```

      INTEGER IDESTN(210), DESTN
      INTEGER D(100)
      REAL D(50), T(50,100)
      REAL RATIO(210,11), TIME(11), ZONE(11), TICALN(12)/12*0.7
      N = 0
      TOTRAV = 0.
      REWIND 3
      REWIND 4
      DO 20 I = 1, 210
      READ (3, 11) IDESTN(I), (RATIO(I,J), J=1, 11)
11  FORMAT (I4, 11F5.3)
      WRITE(6,19) IDESTN(I), (RATIO(I,J), J=1,11)
19  FORMAT (10X, I4, 11F5.3)
      IF (IDESTN(I) .EQ. -1) GO TO 500
      N = N + 1
20  CONTINUE
      WRITE(6,45)
45  FORMAT (/10X, 'THE PROGRAM TRIED TO READ MORE THAN 210 SETS OF IN-
      -FORMATION FROM THE INITIAL DATA BLOCK'/10X, 'THE JOB WAS CANCELL
      -ED')
      GO TO 300
500 WRITE(6, 501)
501 FORMAT (/10X, 'THE TAPE DATA WAS STORED')
      READ (5, 5) I, J
5  FORMAT (2I10)
      WRITE (6, 5) I, J
      READ (5, 6) (D(IA), IA=1, I)
6  FORMAT (20A4)
      WRITE (6, 3) (D(IA), IA = 1, I)
3  FORMAT (10X, A4, 19A4)
      JX = J/15 + 1
      JF = 1
      INFORM = 0
      DO 24 JJ = 1, JX
      JF = JF + 14
      IF (JF .GT. J) JF = J
      READ (5, 47) (D(JA), JA = JF, JF)
47  FORMAT (5X, 15F15)
      WRITE (6, 47) (D(JA), JA = JF, JF)
      DO 25 IZ = 1, I
      READ (5, 48) (T(IZ, JZ), JZ = JF, JF)
48  FORMAT (5X, 15F5.0)
25  CONTINUE
      JF = JF + 15
24  CONTINUE
      DO 203 IP = 1, I
      DO 202 JB = 1, J
      WRITE(4,30) D(IP), D(JB), T(IP, JB)
30  FORMAT (6X, A4, 110, F10.0)
      INFORM = INFORM + 1
202 CONTINUE
      WRITE (6, 40) D(IP)
40  FORMAT (/10X, 'ORIGIN ZONE'/15X, A4//)
      WRITE (6, 41) (D(JB), T(IP,JB), JB= 1, J )
41  FORMAT (1X, 10(1X, I4, F5.0, 3X))
203 CONTINUE
      WRITE(6, 9) INFORM

```

```

9  FORMAT (/20X, 'READ IN', 15, 5X, 'SETS OF 2ND BLOCK DATA')
   WRITE(6, 501)
   REWIND 4
   NPAGE = 1
   LINE = 5
   WRITE(6, 33) NPAGE
   WRITE(6, 34)
   WRITE(6, 35)
   WRITE(6, 36)
   WRITE(6, 37)

```

```

100 READ (4,12) ORIGIN, DESTN, TRAVEL
12  FORMAT (6X, A4, 110, F10.0)
   IF (DESTN.LT. -90) GO TO 300
   IF (TRAVEL.LT. 1.0) GO TO 250
   M = 1
   DO 21 IA = 1, N
   IF (IDESTN(IA).EQ. DESTN) GO TO 105
   M = M + 1
21  CONTINUE
   IF (DESTN.LT. 99) WRITE(6,3001) ORIGIN,DESTN, TRAVEL
   IF (DESTN.GT.999) WRITE(6,301 ) ORIGIN,DESTN, TRAVEL
   IF (DESTN.GT.99 .AND. DESTN.LT.999)WRITE(6,31)ORIGIN,DESTN,TRAVEL
301 FORMAT (/6X, A4, ' ', I4, F8.0, 4X, 'THE RATIO FOR CALCULATION
-S CANNOT BE FOUND FOR THIS ZONE')
3)  FORMAT (/6X, A4, ' 0', I3, F8.0, 4X, 'THE RATIO FOR CALCULATION
-S CANNOT BE FOUND FOR THIS ZONE')
2001 FORMAT (/6X, A4, ' 00', I2, F8.0, 4X, 'THE RATIO FOR CALCULATION
-S CANNOT BE FOUND FOR THIS ZONE')
   GO TO 69
250 IF (DESTN.LT. 99) WRITE(6,3002) ORIGIN,DESTN, TRAVEL,TRAVEL
   IF (DESTN.GT.999) WRITE(6,302 ) ORIGIN,DESTN, TRAVEL,TRAVEL
   IF (DESTN.GT.99 .AND. DESTN.LT.999)WRITE(6,32)ORIGIN,DESTN,TRAVEL,
2TRAVEL
302 FORMAT(/6X,A4,' ', I4,F8.0,70X,F5.0)
32  FORMAT(/6X,A4,' 0', I3,F8.0,70X,F5.0)
3002 FORMAT(/6X,A4,' 00', I2,F8.0,70X,F5.0)
   GO TO 69
105 TOTZON = 0
   TOTRAV = TOTRAV + TRAVEL
   DO 22 JA =1, 11
   ZONE(JA) = TRAVEL*RATIO(M,JA)
   TOTZON = TOTZON + ZONE(JA)
   TICALN(JA) = TICALN(JA) + ZONE(JA)
22  CONTINUE
   TICALN (12) = TICALN(12) + TOTZON
   IF (DESTN.LT. 99) WRITE(6,3003) ORIGIN,DESTN, TRAVEL,ZONE,TOTZON
   IF (DESTN.GT.999) WRITE(6,303 ) ORIGIN,DESTN, TRAVEL,ZONE,TOTZON
   IF (DESTN.GT.99 .AND. DESTN.LT.999)WRITE(6,33)ORIGIN,DESTN,TRAVEL,
3ZONE,TOTZON
303 FORMAT (/6X, A4, ' ', I4, F8.0, 3X, 12F6.1)
33  FORMAT (/6X, A4, ' 0', I3, F8.0, 3X, 12F6.1)
3003 FORMAT (/6X, A4, ' 00', I2, F8.0, 3X, 12F6.1)
69  LINE = LINE + 2
   IF (DESTN.EQ. 3110) GO TO 95
   IF (LINE.GE. 52) GO TO 96
   GO TO 100
95  WRITE(6, 17) TOTRAV, TICALN

```

```

17 FORMAT (1/10X, 'TOTAL', 5X, F5.0, 2X, 12F6.1)
TOTRAV = 0.
DO 23 J1 = 1, 12
TICALM(J1) = 0.
23 CONTINUE
GO TO 27
26 WRITE(6, 17) TOTRAV, TICALM
27 NPAGE = NPAGE + 1
LINE = 5
WRITE (6, 38) NPAGE
38 FORMAT (1H1//10X, 'PAGE NO:', 14)
WRITE(6, 34)
34 FORMAT (1/5X, 'ORIGIN - DESTINATION', 15X, 'THE CALCULATED BREAKDOWN
-OF WORKTRIPS BY TIME', 2X, 'STUDY', 5X, '1967')
WRITE(6, 35)
35 FORMAT (1/5X, 'ORIGIN', 2X, 'DESTIN. NUMBER', 64X, 'TIME', 3X, 'GRAND')
WRITE(6, 36)
36 FORMAT(22X, 'DE', 6X, '7:15 7:30 7:45 8:00 8:15 8:30 8:45 9:0
-0 8:15 8:30 8:45 9:00')
WRITE(6, 37)
37 FORMAT (20X, 'W-TRIPS', 60X, 'TOTAL')
GO TO 100
100 CONTINUE
REWIND 3
REWIND 4
STOP
END

```

CORRECTION OF 1967 O-D DATA

(BASED ON 85% SAMPLE)


```

    DIMENSION NZONE(225),NTM(225),NTF(225),NTT(225),RATIOM(225),
1RATIOF(225),RATIOT(225),NC1TT(225),NC1TM(225),NC1TF(225),RATCBD(7)
2,NC2TT(225),NC2TM(225),NC2TF(225),NPTT(225),NPTM(225),NP TF(225),
3LTOT(12)
    DATA LTOT/12*0/
    N=1
    DO 100 I = 1, 225
    READ(5,10) NZONE(I), NTM(I), NTF(I)
10  FORMAT (1615)
    IF (NZONE(I) .LT. 9) GO TO 200
    N = N + 1
100  CONTINUE
200  NTRIPS = 0
    N = N - 1
    DO 101 I = 1, N
    NTT (I) = NTM(I) + NTF (I)
    NTRIPS = NTRIPS + NTT(I)
    XMALE = NTM(I)
    XTRIP = NTT(I)
    RATIOM(I) = (XMALE/XTRIP)* 100.
    RATIOF(I) = 100. - RATIOM(I)
101  CONTINUE
    XTRIP = NTRIPS
    DO 102 I = 1, N
    TRIP = NTT(I)
    RATIOT(I) = TRIP/XTRIP
    CORR1 = RATIOT(I) * 126048.
    XMALE = (CORR1*RATIOM(I))/100.0
    NC1TT(I) = CORR1+ 0.5
    NC1TM(I) = XMALE + 0.5
    NC1TF(I) = NC1TT(I) - NC1TM(I)
102  CONTINUE
    CBDTT = 32189.
    MTRIPS = 0
    DO 107 J = 1, 7
107  MTRIPS = MTRIPS + NC1TT(J)
    XMTRIP = MTRIPS
    DO 103 J = 1, 7
    CBDATT = NC1TT(J)
    RATCBD(J) = CBDATT/XMTRIP
    CBDC2T = RATCBD(J)*CBDTT
    CBDC2M = (CBDC2T*RATIOM(J))/100.0
    NC2TT(J) = CBDC2T + 0.5
    NC2TM(J) = CBDC2M + 0.5

```



```

NC2TF (J) = NC2TT(J) - NC2TM(J)
103 CONTINUE
XDIF = 93859.
DO 104 L = 8, N
XC2TN = NC1TM(L)
XC2TT = NC1TT(L)
CORR2 = (XC2TT/91201.) * XDIF
CBDC2M = (XC2TM/XC2TT) * CORR2
NC2TT(L) = CORR2 + 0.5
NC2TM(L) = CBDC2M + 0.5
NC2TF(L) = NC2TT(L) - NC2TM(L)
104 CONTINUE
PEAK = 0.607
DO 105 I = 1, N
PNC2% = NC2TT(I)
PNC2TT + PNC2TT * PEAK
PNC2TM - (PNC2TT * RATIONOM(I))/100.0
NPTT(I) = PNC2TT + 0.5
NPTM(I) = PNC2TM + 0.5
NPTF(I) = NPTT(I) - NPTM(I)
105 CONTINUE
I = 0
201 LINE = 1
WRITE (6, 20)
WRITE (6, 21)
WRITE (6, 22 )
204 I = I + 1
IF (I .GT. N ) GO TO 203
IF (NZONE(I) .EQ. 2010) GO TO 207
202 WRITE (6, 23) NZONE(I), NTM(I), NTF(I), NTT(I), RATIONOM(I), RATIOF(
11), NC1TM(I), NC1TF(I), NC1TT(I), NC2TM(I), NC2TF(I), NC2TT(I),
2NPTM(I), NPTF(I), NPTT(I)
GO TO 208
207 WRITE(6, 20)
WRITE(6, 21)
WRITE(6, 22)
LINE = 1
GO TO 202
208 CONTINUE
LTOT( 1) = LTOT( 1) + NTM(I)
LTOT( 2) = LTOT( 2) + NTF(I)
LTOT( 3) = LTOT( 3) + NTT(I)
LTOT( 4) = LTOT( 4) + NC1TM(I)
LTOT( 5) = LTOT( 5) + NC1TF(I)
LTOT( 6) = LTOT( 6) + NC1TT(I)
LTOT( 7) = LTOT( 7) + NC2TM(I)

```



```

    LTOT( 8) = LTOT( 8) + NC]TF(I)
    LTOT( 9) = LTOT( 9) + NC2TT(I)
    LTOT(10) = LTOT(10) + NPTM(I)
    LTOT(11) = LTOT(11) + NPTF(I)
    LTOT(12) = LTOT(12) + NPTT(I)
    LINE = LINE + 1
    IF (LINE .GE. 50) GO TO 201
    GO TO 204
203 WRITE (6, 24) (LTOT(L) , L = 1, 12)
20  FORMAT (1H1//50X, 'EMPLOYMENT BY ZONE 1967')
21  FORMAT (/8X, '-----1967  O-D SURVEY-----',
1      5X, '--1ST  CORRECTION--',
3      5X, '--2ND  CORRECTION--',
4      5X, 'CORRECTED PEAK TRIPS')
22  FORMAT (2X, 'ZONE MALE FEMALE  TOTAL  MALE%  FEMALE%',
13(5X, 'MALE  FEMALE  TOTAL'))
23  FORMAT (2X, 14, 16, 18, 17, F7.2, F9.2, 3(3X, 16, 1X, 217))
24  FORMAT (6X, 16, 18, 17, 16X, 3(3X, 16, 1X, 217))
    STOP
    END

```


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SIMPLE CORRELATION AND PLOTTING PACKAGE CS022

by V. E. Yanda


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2          MAIN-LINE PROGRAM FOR PLATS AND CORRELATIONS
      REAL                                XMIN(100),XMAX(100),X(1,1500),Y(1500)
      REAL*8 SUM(100), S(5050)
      EQUIVALENCE (X(1,1),Y(1))
      INTEGER                            VFMT,UNIT,TERMV,JXV(14)
      REAL*8 KWRD(6)/'MASTER  FORMAT  LABEL  PLOT  REGRES  FINISH  '/
1,KEY
      INTEGER*2 BLANK/'  '/
      INTEGER*2 LAB(15,100)
      DO 777 I=1,15
      DO 777 J=1,100
777  LAB(I,J)=BLANK
C  READ-IN OF PARAMETERS
1  READ(5,10)KEY,IDENT,NVAR,NUMOBS,VFMT,UNIT,TERMV,KEEPLB,KEEPFM
2  IF(KWRD(6).EQ.KEY)CALL EXIT
      NROWS=1500/NVAR
      NLOC=NVAR*(NVAR+1)/2
      CALL CORREL (NVAR,NROWS,S,SUM,XMIN,XMAX,X,Y,LAB,KWRD,NUMOBS,VEMT,UN
1IT,KEY,TERMV,IDENT,KEEPLB,KEEPFM,IX,JXV,JY,J,NUMVAR,NLOC)
      IF(IX.NE.7) GO TO 3
      WRITE(6,11)J,NUMVAR
      CALL EXIT
3  IF(IX.NE.4)GO TO 4
      IF(KEY.NE.KWRD(1).AND.KEY.NE.KWRD(6)GO TO 4
      IDENT=JY
      NVAR=JXV(1)
      NUMOBS=JXV(2)
      VFMT=JXV(3)
      UNIT=JXV(4)
      TERMV=JXV(5)
      KEEPLB=JXV(6)
      KEEPFM=JXV(7)
      GO TO 2
4  WRITE(6,12)KWRD(IX),KEY
      STOP
10  FORMAT(A6,14,1415)
11  FORMAT(36H1WHILE ATTEMPTING TO READ LABEL CARD,14,31H PROGRAM ENCO
1UNTERED LABEL CARD,14,17H. JOB TERMINATED.)
12  FORMAT(26H1WHILE ATTEMPTING TO READ ,A6,26H CARD PROGRAM ENCOUNTER
1ED ,A6,22H CARD. JOB TERMINATED.)
      END

      SUBROUTINE CORREL(NVAR,NROWS,S,SUM,XMIN,XMAX,X,Y,LAB,KWRD,NUMOBS,
1VFMT,UNIT,KEY,TERMV,IDENT,KEEPLB,KEEPFM,IX,JXV,JY,J,NUMVAR,NLOC)
      REAL                                XMIN(NVAR),XMAX(NVAR),X(NROWS,NVA
1R,Y(1500),                                FMT(18),REGENT(18),DO TV(120),SMIN(100),
2SMAX(100)

```



```

INTEGER*2 LAB(15,100)
INTEGER*2 LOD(100) .LL(20)
INTEGER          VFMT,UNIT,TERMV,          JXV(14)
INTEGER*2 M(60,100)
REAL*8 KWRD(6),KEY
REAL*8 SUM(NVAR),FN,FNMI,SUMCOR,TERM1,TERM2 ,S(NLOC)
LOGICAL*1 RSMIN(100)/100*F/,RSMAX(100)/100*F/
DATA REGMT/72H(10X,7F10.0)

1          /
DATA DOT/1H./
DATA PLUS/1H+/
DO 1001 I=1,120
1001 DOTV(I)=DOT
IX=1
IF(KWRD(1).NE.KEY) GO TO 999
IF(UNIT.EQ.0)UNIT=5
KLIK=2
IF(TERMV.EQ.0.AND.NUMOBS.GT.1)KLIK=1
IF(TERMV.EQ.0.)TERMV=1
IF(VMT.EQ.L)GO TO 2
IF(VFMT.EQ.2)GO TO 3
IF(KEEPFM.EQ.1.OR.VFMT.EQ.3)GO TO 4
C ASSIGNMENT OF REGULAR FORMAT
DO 1 I=1,18
1 FMT(I)=REGFMT(I)
GO TO 4
c read-IN OF FORMAT
2 READ(5, 90)KEY,FMT
IX=2
IF(KWRD(2).NE.KEY)GO TO 999
GO TO 4
3 KLIK=3
4 REWIND 1
C INITIALIZATION OF WORK MATRICES
DO 403 I=1,NVAR
SUM(I)=0
XMIN(I)=1.E75
XMAX(I)=-1.E75
DO 403 J=1NLOC
403 S(J)=0.0D0
C READ-IN OF LABELS
IF(KEEPLB.NE.1)GO TO 407
404 DO 405 J=1,NVAR
RSMIN(I)=.FALSE.
RXMAX(I)=.FALSE.
READ(5,91)KEY,NUMVAR,(LAB(I,J),I=1,15)RSMIN(J),SMIN(J),RSMAX(J),
1 SMAX(J)

```



```

      IX=3
      IF(KWRD(3).NE.KEY)GO TO 999
      IF(J.NE.NUMVAR)GO TO 998
405   CONTINUE
407   NOBS=0
      NBLOKS=0
5     NBLOKS=NBLOKS+1
C     READ-IN OF DATA
      GO TO (6,10,8),KLIK
6     DO 7 K=1,NROWS
      READ(UNIT,FMT)(X(K,J),J=1,NVAR)
      NOBS=NOBS+1
      NUMLST=K
      IF(NOBS.EQ.NUMBOS)GO TO 12
7     CONTINUE
      GO TO 12
8     DO 9 K=1,NROWS
      READ(UNIT)(X(K,J),J=1,NVAR)
      NOBS=NOBS+1
      NUMLST=K
      IF(NOBS.EQ.NUMBOS)GO TO 12
9     CONTINUE
      GO TO 12
10    DO 11 K=1,NROWS
      READ(UNIT,FMT)(X(K,J),J=1,NVAR)
      IF(X(K,TERMV).LT.0.)GO TO 12
      NOBS=NOBS+1
11    NUMLST=K
C     COMPUTATION OF SUMS, PRODUCTS, MINIMA AND MAXIMA
12    DO 10000 K=1,NUMLST
      DO 10010 J=1,NVAR
      SUM(J)=SUM(J)+X(K,J)
      XMIN(J)=AMINI(XMIN(J),X(K,J))
      XMAX(J)=AMAXI(XMAS(J),X(K,J))
10010 CONTINUE
10000 CONTINUE
      DO 10060 J=1,NVAR
      DO 10070 I=J,NVAR
      CALL LOC(I,J,IJ,NVAR,NVAR,1)
      DO 10080 K=1,NUMLST
      TERM1=X(K,I)
      TERM2=X(K,J)
      S(IJ)=S(IJ)+TERM1*TERM2
10080 CONTINUE
10070 CONTINUE

```



```

10060 CONTINUE
C FOLLOWING CARD INSERTED OCTOBER 24, 1969
    K=NUMLST+1
    WRITE(1)Y
    GO TO (14,15,14,),KLIK
14  IF(NOBS.EQ.NUMOBS)GO TO 16
    GO TO 5
15  IF(X(K,TERMV).LT.0.)GO TO 16
    GO TO 5
C REMOVE THESE CARDS
C16  ENDFILE 1
C    BACKSPACE 1
16  REWIND 1
    LINES=60
    EN=NOBS
    FNMI=NOBS-1
    NVARMI=NVAR-1
    DO 11000 J=1,NVAR
    CALL LOC(J,J,JJ,NVAR,NVAR,1)
    LOD(J)=JJ
11000 CONTINUE
    DO 18 J=1,NVAR
    DO 17 I=J,NVAR
C COMPUTATION OF COVARIANCES
    CALL LOC(I,J,IJ,M,M,1)
    S(IJ)=(S(IJ)-(SUM(I)*SUM(J))/FN)/FNMI
C COMPUTATION OF STANDARD DEVIATIONS
17  IF(I.EQ.J) S(IJ)=DSQRT(S(IJ))
C COMPUTATION OF MEANS
    SUM(J)=SUM(J)/EN
    IF(LINES.LT.60)GO TO 1705
    WRITE(6,99)IDENT
    WRITE(6,100)
    LINES=4
1705 LINES=LINES+2
    WRITE(6,101)J,(LAB(K,J),K=1,15),SUM(J),S(LOD(J)),XMIN(J),XMAX(J)
    IF(RSMIN(J)XMIN(J)=SMIN(J)
18  IF(RSMAX(J)XMAX(J)=SMAX(J)
    DO 20 I=1,NVARMI
    IPI=I+1
C COMPUTATION OF CORRELATION COEFFICIENTS
    DO 19 J=IPI,NVAR
    CALL LOC(I,J,IJ,M,M,1)
19  S(KJ)=S(KJ)/(S(LOD(I))*S(LOD(J)))
    20 CONTINUE
C OUTPUT OF CORRELATION COEFFICIENTS

```



```

      IJ=2
      DO 22 L1=1,NVARM1,18
      LIM=L1+17
      L2=MINO(LIM,NVARML)
      LINES=60
      DO 21 J=IJ,NVAR
      IF(LINES.LT.60)GO TO 205
      WRITE(6,99)IDENT
      WRITE(6,104)NOBS
      WRITE(6,102)(I,I=L1,L2)
      LINES=6
205   JM1=J-1
      L2= MINO(JM1,LIM)
      LINES=LINES+2
      DO 11010 I=L1,L2
      CALL LOC(I,J,IJ,M,M,1)
      LL(I-L1+1)=IJ
11010 CONTINUE
21    WRITE(6,103) J,(S(LL(I-L1+1))),I=L1,L2)
22    IJ=IJ+18
C     READ-IN OF SPLOT AND/OR REGRES CARDS
2205  READ(5,92)KEY,JY,(JXV(K),*=1,14)
      IX=4
      IF(KWRD(4).NE.KEY,AND.KWRD(5).NE.KEY)GO TO 999
      DO 45 KK=1,14
      IF(JXV(KK).IE.O.OR.JXV(KK).GT.NVAR)GO TO 2205
      JX=JXV(KK)
      YRANGE=XMAX(JU)-XMIN(JY)
      XRANGE=XMAX(JX)-XMIN(JX)
C PICK PROPER SUBSCRIPTS FOR CORRELATION COEFFICIENT
      I=MINO(JX,JY)
      J=MAXO(JX,JY)
      CALL LOC(I,J,IJ,M,M,1)
      R=S(IJ)
      IF(KWRD(4).EQ.KEY)GO TO 2255
C COMPUTATION OF LINEAR REGRESSION COEFFICIENT, CONSTANT AND T-VALUE
      B=(R*S(LOD(JY))/S(LOD(JX)))
      A=SUM(JY)-B*SUM(JX)
      DENOM=1.-R*R
      T=1.E38
      IF(DENOM.NE.O.)T=R*DSQRT((EN-2.0)/DENOM)
C THIS PIECE READS THE BINARY DATA, PIGEON-HOLES IT, AND FIXES UP THE CELLS
2255  NUMOFF=0
      DO 23 I=1,60
      DO 23 J=1,100

```



```

23  M(I,J)=0
    NUMPTS=NROWS
    DO 24 INDEX=1,NBLOKS
      IF(NBLOKS.GT.1)READ(1)Y
      IF(INDEX.EQ.NBLOKS)NUMPTS=NUMLST
      DO 24 K=1,NUMPTS
        I=IFIX(59.99*(X(K,JY)-XMIN(JY))/YRANGE)+1
        IF(I.LE.0.OR.I.GT.60)GO TO 2305
        J=IFIX(99.99*(X(K,JX)-XMIN(JX))/XRANGE)+1
        IF(J.LE.0.OR.J.GT.100)GO TO 2305
        M(I,J)=M(I,J)+1
      GO TO 24
2305 NUMOFF=NUMOFF+1
24  CONTINUE
    CALL FIXUP(M)
    IF(KWRD(5).NE.KEY)GO TO 26
    X1=SMIN(JX)-XRANGE/200.
    X2=XMAX(JX)+XRANGE/200.
    Y1=XMIN(JY)-YRANGE/120.
    Y2=XMAX(JY)+YRANGE/120.
    IF(B.EQ.0.)GO TO 26
    XX=(Y2-A)/B
    J=IFIX(99.99*(XX-XMIN(JX))/XRANGE+1.)
    J=J+1
    IF(J.LT.1.OR.J.GT.102)GO TO 26
    DOTV(J)=PLUS
C PRINT GRAPH
26  WRITE(6,114) IDENT, (DOTV(K),K=1,102)
    IF(J.GE.1.AND.J.LE.102)DOTV(J)=DOT
    IF(KWRD(5).NE.KEY)GO TO 2615
    YY=A+B*X1
    I1=IFIX(59.99*(YY-XMIN(JY))/YRANGE+1.)
    IF(I1.LT.1.OR.I1.GT.60)GO TO 2605
    DOTV(I1)=PLUS
2605 YY=A+B*X2
    I2=IFIX(59.99*(YY-XMIN(JY))/YRANGE+1.)
    I2=I2+60
    IF(I2.LT.61.OR.I2.GT.120)GO TO 2615
    DOTV(I2)=PLUS
2615 WRITE(6,115)XMAX(JY),DOTV(60),(M(60,J),J=1,100)DOTV(120)
    DO 27 I=1,27
      IK=60-I
      WRITE(6,116)DOTV(IK),(M(IK,J),J=1,100),DOTV(IK+60)
      WRITE(6,125)JY,DOTV(32),(M(32,J),J=1,100),DOTV(92)
      WRITE(6,119)(LAB(I,JY),I=1,15),DOTV(31),(M(31,J),J=1,100),DOTV(91)
      L2=42
      IF(KEY.EQ.KWRD(5))I2=38
    DO 28 I=30,L2

```



```

      IK=60-1
28  WRITE(6,116)DOTV(IK),(M(IK,J),J=1,100),DOTV(IK+60)
      IF(KEY.NE.KWRD(5))GO TO 29
      WRITE(6,120)DOTV(21),(M(21,J),J=1,100),DOTV(81)
      WRITE(6,121)A,DOTV(20),(M(20,J),J=1,100),DOTV(80)
      WRITE(6,122)B,DOTV(19),(M(19,J),J=1,100),DOTV(79)
      WRITE(6,1225)T,DOTV(18),(M(18,J),J=1,100),DOTV(78)
29  WRITE(6,123)NOBS,DOTV(17),(M(17,J),J=1,100),DOTV(77)
      WRITE(6,124)R,DOTV(16),(M(16,J),J=1,100),DOTV(66)
      DO 30 I=45,58
      IK=60-1
30  WRITE(6,116)DOTV(IK),(M(IK,J),J=1,100),DOTV(IK+60)
      WRITE(6,115)XMIN(JY),DOTV(1),(M(L,J),J=1,100),DOTV(61)
      IF(11.GE.1.AND.11.LE.60)DOTV(11)=DOT
      IF(12.GE.61.AND.12.LE.120)DOTV(12)=DOT
      IF(KWRD(5).NE.KEY)GO TO 37
      XX=(Y1-A)/B
      J=IFIX(99.99*(XX-SMIN(JX))/XRANGE+1.)
      J=J+1
      IF(J.LT.1.OR.J.GT.102)GO TO 37
      DOTV(J)=PLUS
37  WRITE(6,117)(DOTV(K),K=1,102)
      IF(J.GE.1.AND.J.LE.102)DOTV(J)=DOT
      WRITE(6,118)XMIN(JX),JX,(LAB(I,JX),I=1,15),XMAX(JX)
      IF(NUMOFF.GT.0)WRITE(6,126)NUMOFF
45  REWIND 1
      GO TO 2205
998  IX=7
90  FORMAT(A6,18A4)
91  FORMAT(A6,14,15A2.2(L1,F9.0))
92  FORMAT(A6,14,14I5)
99  FORMAT(1H1,15)
100  FORMAT(1H0,4X,8HVARIALE,28X,4HMEAN,5X,9HSTD. DEV.,7X,7HMINIMUM,
      17X,7HMAXIMUM)
101  FORMAT(/,1X,13,1X,15A2,4G14.6)
102  FORMAT(/,4X,18I7)
103  FORMAT(/,1X,13,2X18F7.3)
104  FORM(1H0,5X,24HCORRELATION COEFFICIENTS,10X,12HSAMPLE SIZE=,15)
114  FORMAT(1H1,15,24X,102A1)
115  FORMAT(17X,G13.6,102A1)
116  FORMAT(30X,102A1)
117  FORMAT(30X,102A1)
118  FORMAT(23X,G13.6,20X,8HVARIALE,13,1X,15A2,20X,G13.6)
119  FORMAT(1X,14A2,A1,102A1)
120  FORMAT(2X,24HLINEAR REGRESSION Y=A+BX,4X,102A1)
121  FORMAT(5X,2HA=,G13.6,10X102A1)
122  FORMAT(5X,2HB=,G13.6,10X102A1)

```



```

1225 FORMAT(5X,2HT=,F6.2,17X,102A1)
123  FORMAT(5X,2HN=,16,17X,102A1)
124  FORMAT(5X,2HR=,F6.3,17X,102A1)
125  FORMAT(1X,8HVARIBLE,13,18X,102A1)
126  FORMAT(1X,110,42H POINTS WERE OFF SCALE FOR THE ABOVE PLOT.)
999  RETURN
      END

```

```

      SUBROUTINE FIXUP (M)
      INTEGER*2 M(60,100)
      INTEGER*2 CHAR(10)/'* 2 3 4 5 6 7 8 9 # '/,BLANK/'  '/'
      DO 3 I=1,60
      DO 2 J=1,100
      IF(M(I,J).GT.0)GO TO 1
      GO TO 2
1     IF(M(I,J).GT.10)M(I,J)=10
      M(I,J)-CHAR(M(I,J))
2     CONTINUE
3     CONTINUE
      RETURN
      END

```


APPENDIX E

MALE AND FEMALE EMPLOYMENT AND TRAVEL CHARACTERISTICS

TABLE E-1

FEMALE TRANSIT PASSENGERS (1967 0-D)

Time		DESTINATION ZONES						Total
From	To	0010	0020	0030	0040	0050	0060	
7:00	7:30	134	70	15	39	7	45	301
7:30	8:00	548	326	37	90	7	143	1151
8:00	8:30	727	465	47	197	19	327	1790
8:30	9:00	465	562	10	109	16	14	1177
9:00	9:30	107	196	1	15	1	1	321
The rest		543	340	8	74	13	32	1013
Overall Total		2531	1959	118	524	63	562	5763

TABLE E-2
FEMALE AUTO DRIVERS (1967 O-D)

		DESTINATION ZONES							Total
Time From	To	0010	0020	0030	0040	0050	0060	0070	
7:00	7:30	19	13	4	7	0	21	0	65
7:30	8:00	96	56	17	45	6	75	3	298
8:00	8:30	162	112	18	48	19	171	1	531
8:30	9:00	82	81	7	43	11	20	1	245
9:00	9:30	12	19	0	3	2	2	0	38
The rest		113	56	5	27	12	16	0	229
Overall Total		484	337	51	173	50	305	5	1405

TABLE E-3

FEMALE AUTO PASSENGERS (1967 O-D)

Time		DESTINATION ZONE							Total
From	To	0010	0020	0030	0040	0050	0060	0070	
7:00	7:30	46	37	11	16	1	26	0	137
7:30	8:00	264	163	40	74	6	89	0	636
8:00	8:30	343	237	36	124	5	295	0	1040
8:30	9:00	77	130	2	31	2	13	0	256
9:00	9:30	13	49	0	2	0	1	0	65
The rest		82	42	4	19	5	10	0	162
Overall Total		825	658	93	266	19	434	0	2295

TABLE E-4

OTHER MODES OF TRANSPORTATION - FEMALE (1967 O-D)

Time		DESTINATION ZONES							Total
		0010	0020	0030	0040	0050	0060	0070	
7:00	7:30	9	8	2	13	0	6	0	38
7:30	8:00	79	45	9	32	1	46	0	213
8:00	8:30	123	79	11	76	3	199	2	493
8:30	9:00	55	61	0	28	3	3	1	151
9:00	9:30	12	23	0	2	0	1	0	38
The rest		73	32	0	19	3	5	0	133
Overall Total		351	248	23	170	11	260	3	1066

TABLE E-5

MALE TRANSIT PASSENGERS (1967: O-D)

Time From To	DESTINATION ZONES							Total
	0010	0020	0030	0040	0050	0060	0070	
7:00 7:30	169	84	14	29	6	29	4	335
7:30 8:00	563	301	46	120	5	73	13	1121
8:00 8:30	474	132	10	40	2	81	1	741
8:30 9:00	148	125	1	15	2	4	0	298
9:00 9:30	20	30	0	2	0	0	0	52
The rest	480	126	20	54	13	57	10	760
Overall Total	1854	798	91	264	28	244	28	3307

TABLE E-6

MALE AUTO DRIVERS (1967 O-D)

Time From To	DESTINATION ZONES							Total
	0010	0020	0030	0040	0050	0060	0070	
7:00 7:30	377	193	92	180	11	140	28	1021
7:30 8:00	1347	909	354	565	43	604	90	3906
8:00 8:30	1269	845	188	483	33	1030	21	3869
8:30 9:00	472	483	26	190	14	74	2	1261
9:00 9:30	48	56	1	16	2	4	0	127
The rest	1044	356	175	297	19	159	42	2092
Overall Total	4557	2842	836	1731	122	2011	177	12276

TABLE E-7

MALE AUTO PASSENGERS (1967 O-D)

Time From To	DESTINATION ZONES							Total
	0010	0020	0030	0040	0050	0060	0070	
7:00 7:30	22	10	5	13	0	10	2	62
7:30 8:00	132	78	22	40	4	55	5	336
8:00 8:30	155	42	6	17	1	73	0	294
8:30 9:00	18	23	1	6	0	0	0	48
9:00 9:30	2	3	0	0	0	0	0	5
The rest	42	20	5	10	1	15	1	94
Overall Total	371	176	39	86	6	153	8	839

TABLE E-8

OTHER MODES OF TRANSPORTATION - MALE (1967 O-D)

Time		DESTINATION ZONES							Total
		0010	0020	0030	0040	0050	0060	0070	
From	To								
7:00	7:30	32	18	7	13	0	19	2	91
7:30	8:00	95	67	17	33	8	38	6	264
8:00	8:30	79	56	2	31	3	113	1	286
8:30	9:00	28	42	0	12	2	3	1	88
9:00	9:30	7	9	0	1	0	0	0	17
The rest		133	64	7	22	6	14	5	251
Overall total		374	256	33	112	19	187	15	996

TABLE E-9
SUMMARY OF 1967 O-D SURVEY

Modes of Transportation	DESTINATION ZONES							Total
	0010	0020	0030	0040	0050	0060	0070	
Male - Transit	1854	798	91	264	28	244	28	3307
- Auto Driver	4557	2842	836	1731	122	2011	177	12276
- Auto Passenger	371	176	39	86	6	153	8	839
- Others	374	256	33	112	19	187	15	996
Male - Total	7156	4072	999	2193	175	2595	228	17418
Female - Transit	2531	1959	118	524	63	562	6	5763
- Auto Driver	484	337	51	173	50	305	5	1405
- Auto Passenger	825	658	93	266	19	434	0	2295
- Others	351	248	23	170	11	260	3	1066
Female - Total	4191	3202	285	1133	143	1561	14	10529
Overall Total	11347	7274	1284	3326	318	4156	242	27947

APPENDIX F

LINKS, SPEEDS AND DISTANCES

BETWEEN NODES

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

PAGE 2

PAGE 1

LINK NO.	ORIG NO.	BEST NO.	LINK DIST	LINK SPEED	LINK NO.	ORIG NO.	BEST NO.	LINK DIST	LINK SPEED	LINK NO.	ORIG NO.	BEST NO.	LINK DIST	LINK SPEED
1	1	556	0.0	0.0	51	22	794	0.08	0.2	24	101	46	752	0.21
2	1290	2006	0.40	0.8	52	22	850	0.27	0.9	20	102	46	860	0.10
3	1	554	0.0	0.0	53	22	796	0.07	0.2	21	103	46	858	0.28
4	2	526	0.11	0.3	54	23	350	0.10	0.4	15	104	47	865	0.28
5	2	524	0.0	0.0	55	24	350	0.44	1.8	15	105	47	798	0.12
6	3	336	0.0	0.0	56	24	353	0.20	0.8	15	106	43	370	0.27
7	2006	1290	0.40	1.4	57	25	352	0.25	0.7	21	107	49	804	0.30
8	3	334	0.0	0.0	58	25	360	0.44	1.3	20	108	43	820	0.21
9	4	334	0.0	0.0	59	26	354	0.05	0.1	30	109	49	836	0.25
10	2006	2007	0.25	0.6	60	26	364	0.23	0.7	20	110	49	894	0.23
11	4	732	0.0	0.0	61	27	520	0.05	0.1	30	111	49	874	0.25
12	5	1036	0.06	0.2	62	28	524	0.25	0.7	21	112	50	578	0.07
13	5	1038	0.08	0.3	63	28	518	0.05	0.1	30	113	51	878	0.47
14	5	950	0.11	0.4	64	29	392	0.06	0.2	18	114	52	910	0.64
15	6	1042	0.07	0.2	65	30	330	0.24	0.7	21	115	53	900	0.43
16	7	954	0.12	0.4	66	30	399	0.10	0.3	20	116	53	920	0.03
17	8	522	0.0	0.0	67	31	330	0.31	0.9	21	117	54	926	0.12
18	8	468	0.0	0.0	68	31	524	0.35	1.1	20	118	54	722	0.11
19	9	576	0.12	0.5	69	32	476	0.24	0.7	21	119	55	834	0.30
20	9	510	0.07	0.3	70	32	522	0.42	1.3	19	120	55	900	0.22
21	10	514	0.20	0.8	71	33	570	0.31	1.2	16	121	56	922	0.29
22	10	508	0.10	0.4	72	33	620	0.63	2.5	15	122	56	906	0.47
23	11	312	0.10	0.4	73	34	620	0.16	0.6	15	123	56	924	0.20
24	11	520	0.19	0.8	74	34	614	0.07	0.3	14	124	57	910	0.25
25	12	1290	0.04	0.2	75	35	620	0.13	0.5	16	125	58	930	0.24
26	13	736	0.09	0.3	76	35	626	0.14	0.6	14	126	58	914	0.29
27	13	764	0.28	0.8	77	36	594	0.21	0.6	21	127	58	906	0.27
28	13	542	0.28	0.3	78	36	618	0.27	0.8	20	128	59	912	0.32
29	14	604	0.29	0.9	79	36	572	0.23	0.7	20	129	60	920	0.24
30	14	546	0.28	0.8	80	37	726	0.0	0.0	0	130	60	903	0.34
31	14	608	0.20	0.6	81	38	748	0.08	0.2	24	131	60	896	0.25
32	44	712	0.20	0.6	82	38	854	0.10	0.3	20	132	61	936	0.32
33	15	770	0.22	0.7	83	38	856	0.17	0.5	20	133	61	912	0.33
34	15	496	0.23	1.1	84	39	644	0.27	0.8	20	134	61	916	0.19
35	15	748	0.22	0.8	85	39	663	0.24	0.7	21	135	62	920	0.24
36	15	740	0.11	0.3	86	39	594	0.25	0.7	21	136	63	912	0.0
37	16	700	0.29	0.9	87	39	576	0.48	1.9	15	137	64	916	0.10
38	16	770	0.22	0.7	88	40	674	0.23	0.7	20	138	65	842	0.33
39	16	744	0.21	0.6	89	40	646	0.25	0.7	21	139	65	752	0.22
40	17	700	0.24	0.7	90	40	580	0.36	1.1	20	140	66	754	0.0
41	17	724	0.06	0.1	91	41	725	0.33	1.3	15	141	67	777	0.35
42	18	412	0.31	0.9	92	41	580	0.18	0.7	15	142	67	762	0.22
43	18	476	0.35	1.0	93	42	730	0.22	0.9	15	143	67	776	0.24
44	19	1108	0.05	0.2	94	42	728	0.37	1.5	15	144	68	734	0.07
45	19	746	0.10	0.4	95	43	729	0.10	0.4	15	145	68	732	0.45
46	20	1106	0.09	0.4	96	43	708	0.20	0.8	15	146	69	722	0.35
47	20	734	0.04	0.2	97	44	724	0.25	0.1	30	147	70	654	0.24
48	21	1244	0.15	0.6	98	45	774	0.07	0.2	21	148	70	646	0.26
49	21	848	0.20	0.8	99	45	710	0.28	0.8	21	149	71	674	0.29
50	21	792	0.12	0.5	100	45	752	0.25	1.0	15	150	71	678	0.23

FIGURE 5 (CONT.)

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

PAGE 3

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

PAGE 4

PAGE 3

LINK NO.	ORIG. NODE	DEST. NODE	LINK DIST.	LINK TIME	LINK SPEED	LINK NO.	ORIG. NODE	DEST. NODE	LINK DIST.	LINK TIME	LINK SPEED	LINK NO.	ORIG. NODE	DEST. NODE	LINK DIST.	LINK TIME	LINK SPEED
201	97	434	0.71	2.8	15.	251	122	1066	0.37	1.5	15.	301	144	1228	0.43	1.7	15.
202	98	490	0.48	1.9	15.	252	122	1810	0.27	1.1	15.	302	145	1066	0.13	0.5	15.
203	99	532	0.22	0.9	15.	253	122	1012	0.24	1.0	14.	303	146	930	0.26	1.0	15.
204	99	344	0.47	1.9	15.	254	122	1016	0.23	0.9	15.	304	145	1063	0.14	0.6	14.
205	99	344	0.47	1.9	15.	255	123	1218	0.19	2.8	14.	305	147	1226	0.10	0.4	15.
206	99	450	0.27	0.6	20.	256	123	1206	0.07	0.3	14.	306	143	984	0.20	0.8	15.
207	99	456	0.49	1.5	20.	257	124	1200	0.18	0.7	15.	307	149	934	0.11	0.4	17.
208	100	454	0.20	0.6	20.	258	125	1194	0.24	1.0	14.	308	150	1026	0.15	0.6	15.
209	100	456	0.41	1.2	21.	259	125	1280	0.18	0.7	15.	309	151	1016	0.21	0.8	15.
210	101	458	0.23	0.9	15.	260	125	1252	0.24	1.0	14.	310	151	1148	0.46	1.8	15.
211	102	346	0.22	1.7	15.	261	125	1254	0.37	1.5	15.	311	152	1000	0.12	0.9	15.
212	102	346	0.22	1.7	15.	262	126	1292	0.32	1.3	15.	312	153	1150	0.17	0.7	15.
213	103	346	0.43	1.9	15.	263	126	1196	0.13	0.5	16.	313	153	1148	0.19	0.8	14.
214	103	346	0.43	1.9	15.	264	127	1224	0.16	0.6	16.	314	154	1022	0.47	1.9	15.
215	104	1200	0.34	0.2	12.	265	128	1210	0.32	1.3	15.	315	154	1150	0.34	1.4	15.
216	104	1200	0.34	0.2	12.	266	128	1222	0.20	0.8	15.	316	154	1152	0.13	0.5	16.
217	104	1200	0.34	0.2	12.	267	129	1208	0.26	1.0	16.	317	155	1094	0.23	0.9	15.
218	105	1132	0.19	0.9	14.	268	130	1232	0.26	1.0	16.	318	156	1026	0.45	1.8	15.
219	105	1132	0.19	0.9	14.	269	130	1264	0.20	0.8	15.	319	156	1152	0.25	1.0	15.
220	105	1140	0.13	0.5	16.	270	130	1266	0.16	0.6	16.	320	156	1100	0.41	1.6	15.
221	105	1136	0.17	0.7	15.	271	131	1236	0.11	0.4	17.	321	157	1095	0.34	1.4	15.
222	105	1136	0.17	0.7	15.	272	131	1264	0.26	1.0	16.	322	158	1152	0.64	2.6	15.
223	105	1136	0.17	0.7	15.	273	131	1240	0.25	1.0	15.	323	159	1154	0.99	0.4	14.
224	107	1132	0.12	0.5	14.	274	131	1272	0.18	0.7	15.	324	160	1160	0.42	1.7	15.
225	107	1132	0.12	0.5	14.	275	132	1274	0.10	0.4	15.	325	161	1166	0.08	0.3	15.
226	107	1132	0.12	0.5	14.	276	132	1270	0.25	1.0	15.	326	162	1166	0.64	2.6	15.
227	110	1118	0.20	0.8	15.	277	132	1244	0.48	1.9	15.	327	162	1160	0.50	2.0	15.
228	110	1118	0.20	0.8	15.	278	132	1276	0.16	0.6	16.	328	162	1164	0.35	1.4	15.
229	110	1118	0.20	0.8	15.	279	133	1272	0.22	0.8	15.	329	163	1154	0.31	1.2	16.
230	110	1118	0.20	0.8	15.	280	133	1190	0.24	1.0	14.	330	160	534	0.15	0.9	10.
231	111	1126	0.16	0.6	16.	281	133	1280	0.25	1.0	15.	331	160	301	0.14	1.0	9.
232	111	1134	0.08	0.3	16.	282	133	1248	0.24	1.0	14.	332	160	846	0.09	0.4	14.
233	111	1136	0.11	0.4	17.	283	134	1190	0.08	0.3	16.	333	160	776	0.07	0.5	8.
234	112	1118	0.25	1.0	15.	284	135	1236	0.42	1.7	15.	334	161	562	0.15	1.3	7.
235	112	1120	0.08	0.3	16.	285	135	1322	0.10	0.4	15.	335	161	300	0.14	1.0	9.
236	113	1076	0.42	1.7	15.	286	136	1294	0.05	0.2	15.	336	161	304	0.22	1.5	9.
237	113	1082	0.27	1.1	15.	287	137	1298	0.20	0.8	15.	337	161	1174	0.09	0.5	11.
238	113	1086	0.31	1.2	16.	288	138	1302	0.05	0.2	15.	338	162	306	0.08	0.4	12.
239	114	1086	0.24	1.0	14.	289	139	1308	0.40	1.6	15.	339	162	462	0.12	0.7	10.
240	114	1144	0.14	0.6	14.	290	139	1324	0.10	0.4	15.	340	162	201	0.22	1.5	9.
241	115	1028	0.20	0.8	15.	291	140	1306	0.13	0.5	16.	341	163	304	0.25	1.2	12.
242	116	1142	0.0	0.0	0.	292	140	1326	0.09	0.4	14.	342	163	304	0.03	0.4	12.
243	117	1064	0.05	0.2	15.	293	141	1244	0.44	1.8	15.	343	163	1286	0.17	0.7	15.
244	117	060	0.05	0.2	15.	294	141	1328	0.16	0.6	16.	344	163	304	0.25	1.2	12.
245	118	1144	0.28	1.1	15.	295	142	1330	0.07	0.3	14.	345	163	308	0.0	0.0	0.
246	118	1010	0.15	0.6	15.	296	143	1226	0.38	1.5	15.	346	163	312	0.09	0.4	14.
247	119	1010	0.14	0.6	14.	297	143	1214	0.24	1.0	14.	347	163	308	0.2	0.9	0.
248	119	1026	0.16	0.6	15.	298	143	1222	0.38	1.5	15.	348	163	310	0.0	0.0	0.
249	120	970	0.05	0.2	15.	299	144	1258	0.60	2.4	15.	349	163	310	0.12	0.4	18.
250	121	976	0.05	0.2	15.	300	144	1224	0.38	1.5	15.	350	163	312	0.07	0.3	14.

FIGURE. (CONT.)

(CONT.)

FIGURE.

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME OF THE STREETNETWORK OF THE CITY OF EDMONTON															LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME OF THE STREETNETWORK OF THE CITY OF EDMONTON															LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME OF THE STREETNETWORK OF THE CITY OF EDMONTON														
PAGE 5															PAGE 6															PAGE 6														
LINK NO.	ORIG. NODE	DEST. NODE	LINK DIST.	LINK TIME	LINK SPEED	LINK NO.	ORIG. NODE	DEST. NODE	LINK DIST.	LINK TIME	LINK SPEED	LINK NO.	ORIG. NODE	DEST. NODE	LINK DIST.	LINK TIME	LINK SPEED	LINK NO.	ORIG. NODE	DEST. NODE	LINK DIST.	LINK TIME	LINK SPEED	LINK NO.	ORIG. NODE	DEST. NODE	LINK DIST.	LINK TIME	LINK SPEED															
401	342	449	0.26	0.6	26.	451	372	2008	0.66	1.1	36.	501	418	416	0.21	0.5	25.	551	448	342	0.25	0.6	26.	501	418	416	0.21	0.5	25.															
402	342	240	0.26	0.7	22.	452	372	370	0.39	1.0	23.	502	420	418	0.30	0.7	26.	552	449	30	0.25	1.0	15.	502	420	418	0.30	0.7	26.															
403	342	532	0.47	1.1	26.	453	374	2009	0.44	0.8	33.	503	420	424	1.20	2.4	30.	553	450	449	0.21	0.4	32.	503	420	424	1.20	2.4	30.															
404	342	344	0.25	0.5	30.	454	384	372	0.42	1.0	25.	504	420	94	0.34	1.4	15.	554	450	452	0.48	1.2	24.	504	420	94	0.34	1.4	15.															
405	344	342	0.25	0.5	30.	455	384	90	0.19	0.8	14.	505	422	424	0.46	0.9	31.	555	450	99	0.27	1.1	15.	505	422	424	0.46	0.9	31.															
406	344	48	0.47	1.9	15.	456	386	388	0.25	0.8	19.	506	422	366	0.35	0.8	26.	556	452	450	0.48	1.2	24.	506	422	366	0.35	0.8	26.															
407	344	346	0.50	1.0	30.	457	386	328	0.23	0.7	20.	507	422	35	0.22	0.9	15.	557	452	446	0.34	0.8	26.	507	422	35	0.22	0.9	15.															
408	344	99	0.47	1.9	15.	458	388	390	0.32	1.0	19.	508	422	88	0.44	1.3	15.	558	452	456	0.19	0.4	29.	508	422	88	0.44	1.3	15.															
409	346	344	0.50	1.0	30.	459	388	386	0.25	0.8	19.	509	424	420	1.20	2.4	30.	559	452	454	0.41	1.0	25.	509	424	420	1.20	2.4	30.															
410	346	103	0.46	1.3	15.	460	388	30	0.10	0.4	15.	510	424	426	0.41	0.3	31.	560	454	404	0.54	1.1	29.	510	424	426	0.41	0.3	31.															
411	346	122	0.42	1.7	15.	461	390	418	0.44	1.1	24.	511	424	428	2.04	4.1	30.	561	454	81	0.34	1.4	15.	511	424	428	2.04	4.1	30.															
412	350	320	0.23	0.6	23.	462	390	388	0.32	1.0	19.	512	424	422	0.46	0.9	31.	562	454	100	0.20	0.8	15.	512	424	422	0.46	0.9	31.															
413	350	352	0.69	1.7	24.	463	390	392	0.26	0.8	20.	513	426	424	0.41	0.3	31.	563	454	452	0.41	1.0	25.	513	426	424	0.41	0.3	31.															
414	350	24	0.44	1.3	15.	464	390	332	0.60	1.2	30.	514	426	406	0.70	1.4	30.	564	456	458	0.50	1.0	30.	514	426	406	0.70	1.4	30.															
415	352	350	0.69	1.7	24.	465	392	390	0.26	0.8	20.	515	426	95	0.34	1.4	15.	565	456	100	0.41	1.6	15.	515	426	95	0.34	1.4	15.															
416	352	354	0.54	1.3	25.	466	392	394	0.20	0.6	20.	516	426	86	0.23	0.9	15.	566	456	99	0.49	2.0	15.	516	426	86	0.23	0.9	15.															
417	352	28	0.27	0.7	14.	467	392	29	0.06	0.2	18.	517	428	424	2.04	4.1	30.	567	456	452	0.19	0.4	29.	517	428	424	2.04	4.1	30.															
418	354	356	0.51	1.2	26.	468	394	438	0.73	1.8	24.	518	428	430	0.32	0.6	32.	568	458	101	0.23	0.9	15.	518	428	430	0.32	0.6	32.															
419	354	26	0.55	0.2	15.	469	394	392	0.20	0.6	20.	519	428	372	0.45	0.9	30.	569	458	456	0.50	1.0	30.	519	428	372	0.45	0.9	30.															
420	354	352	0.54	1.3	25.	470	394	396	0.04	0.1	24.	520	430	432	0.81	1.6	30.	570	458	102	0.52	2.1	15.	520	430	432	0.81	1.6	30.															
421	356	354	0.51	1.2	26.	471	396	442	0.46	1.4	20.	521	430	96	0.30	1.2	15.	571	462	308	0.30	1.2	15.	521	430	96	0.30	1.2	15.															
422	356	366	0.20	0.5	24.	472	396	398	0.28	0.7	24.	522	430	91	0.77	3.1	15.	572	462	304	0.12	0.7	10.	522	430	91	0.77	3.1	15.															
423	356	25	0.29	0.8	15.	473	396	418	0.45	1.1	25.	523	430	428	0.32	0.6	32.	573	462	464	0.17	0.4	11.	523	430	428	0.32	0.6	32.															
424	358	324	0.40	1.3	13.	474	396	394	0.04	0.1	24.	524	432	430	0.81	1.6	30.	574	464	462	0.07	0.4	11.	524	432	430	0.81	1.6	30.															
425	358	360	0.37	1.0	22.	475	398	396	0.28	0.7	24.	525	432	434	0.34	0.6	32.	575	464	466	0.11	0.7	9.	525	432	434	0.34	0.6	32.															
426	358	24	0.20	0.9	15.	476	398	400	0.40	1.0	24.	526	432	92	0.34	0.6	32.	576	464	558	0.18	0.5	22.	526	432	92	0.34	0.6	32.															
427	358	32	0.37	1.5	15.	477	398	84	0.30	1.2	15.	527	434	436	1.00	2.0	30.	577	466	498	0.29	1.7	10.	527	434	436	1.00	2.0	30.															
428	360	358	0.27	1.0	22.	478	400	402	0.22	0.5	26.	528	434	432	0.32	0.6	32.	578	466	468	0.42	1.3	19.	528	434	432	0.32	0.6	32.															
429	360	362	0.16	0.4	24.	479	400	398	0.40	1.2	24.	529	434	434	0.50	1.0	30.	579	466	464	0.11	0.7	9.	529	434	434	0.50	1.0	30.															
430	360	25	0.44	1.8	15.	480	400	444	0.18	0.4	27.	530	434	97	0.71	2.3	15.	580	466	560	0.06	0.4	9.	530	434	97	0.71	2.3	15.															
431	362	360	0.16	0.4	24.	481	400	86	0.32	1.3	15.	531	436	434	0.50	1.0	30.	581	468	466	0.42	1.4	18.	531	436	434	0.50	1.0	30.															
432	362	364	0.26	1.0	22.	482	402	404	0.35	1.1	25.	532	436	94	0.50	2.0	15.	582	468	8	0.0	0.0	0.	532	436	94	0.50	2.0	15.															
433	362	416	0.21	0.9	21.	483	402	400	0.22	0.5	26.	533	438	334	0.22	0.5	26.	583	468	470	0.0	0.0	0.	533	438	334	0.22	0.5	26.															
434	364	83	0.35	1.4	15.	484	402	91	0.31	1.2	16.	534	438	394	0.73	1.8	24.	584	470	472	0.43	1.5	17.	534	438	394	0.73	1.8	24.															
435	364	26	0.23	0.9	15.	485	404	402	0.45	1.1	25.	535	438	78	0.24	1.0	14.	585	470	540	0.21	0.7	18.	535	438	78	0.24	1.0	14.															
436	364	366	0.60	1.6	23.	486	404	406	0.0	0.0	0.	536	440	338	0.24	0.6	24.	586	470	468	0.0	0.0	0.	536	440	338	0.24	0.6	24.															
437	364	362	0.36	1.0	22.	487	404	454	0.54	1.1	29.	537	440	442	0.71	1.7	25.	587	470	502	0.0	0.0	0.	5></																				

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

LINK NO.	ORIG. NODE	DEST. NODE	LINK DIST.	LINK SPEED	LINK NO.	ORIG. NODE	DEST. NODE	LINK DIST.	LINK SPEED	LINK NO.	ORIG. NODE	DEST. NODE	LINK DIST.	LINK SPEED
601	478	476	0.31	1.7	701	540	542	0.10	0.4	751	570	572	0.50	1.7
602	478	332	0.98	2.0	702	540	538	0.36	2.2	752	572	574	0.21	1.0
603	480	526	0.21	0.8	703	542	540	0.10	0.4	753	572	726	0.33	0.8
604	480	482	0.40	1.2	704	542	13	0.28	1.1	754	572	36	0.23	0.9
605	480	478	0.23	1.1	705	542	544	0.10	0.4	755	572	570	0.50	1.7
606	480	528	0.50	1.5	706	544	542	0.10	0.4	756	574	576	0.19	0.6
607	482	480	0.40	1.2	707	544	562	0.50	1.2	757	574	594	0.43	2.1
608	482	484	0.08	0.2	708	544	546	0.29	0.7	758	574	572	0.21	1.0
609	482	77	0.21	0.8	709	546	544	0.29	0.9	759	576	39	0.48	1.9
610	484	486	0.38	0.9	710	546	472	0.08	0.3	760	576	578	0.13	0.4
611	484	630	0.48	1.4	711	546	604	0.29	0.9	761	576	574	0.19	0.6
612	484	422	0.08	0.2	712	546	548	0.30	0.8	762	578	576	0.13	0.4
613	484	528	0.22	0.7	713	548	550	0.46	1.3	763	578	646	0.51	1.1
614	486	482	0.10	0.2	714	548	546	0.30	0.8	764	578	580	0.30	0.9
615	486	454	0.28	0.9	715	548	14	0.28	1.1	765	578	728	0.44	0.9
616	486	75	0.13	0.5	716	550	474	0.07	0.4	766	580	41	0.18	0.7
617	488	530	0.14	0.3	717	550	610	0.03	0.2	767	580	40	0.36	1.4
618	488	436	0.10	0.2	718	550	548	0.46	1.3	768	580	582	0.34	0.8
619	488	642	0.50	1.2	719	552	554	0.0	0.0	769	580	578	0.30	0.9
620	488	490	0.25	0.5	720	552	301	0.15	1.3	770	582	730	0.34	0.8
621	490	488	0.25	0.7	721	552	556	0.0	0.0	771	582	580	0.34	0.8
622	490	92	0.43	1.9	722	554	1	0.0	0.0	772	582	674	0.42	1.3
623	490	492	0.56	1.1	723	554	462	0.19	0.8	773	582	584	0.26	0.6
624	492	480	0.56	1.7	724	554	1	0.0	0.0	774	584	586	0.21	0.5
625	492	103	0.49	1.9	725	556	1	0.0	0.0	775	584	72	0.36	1.4
626	496	310	0.0	0.0	726	556	1	0.0	0.0	776	584	71	0.45	1.8
627	496	498	0.12	0.6	727	556	552	0.0	0.0	777	584	582	0.26	0.6
628	496	464	0.30	1.2	728	556	558	0.08	0.3	778	586	680	0.41	1.0
629	498	466	0.29	1.7	729	558	526	0.12	0.4	779	586	732	0.43	1.0
630	498	500	0.13	0.5	730	558	556	0.08	0.3	780	586	584	0.21	0.5
631	498	316	0.22	1.0	731	558	560	0.11	0.5	781	594	574	0.43	2.1
632	498	496	0.12	0.6	732	560	538	0.10	1.0	782	594	39	0.25	1.0
633	500	498	0.13	0.5	733	560	466	0.06	0.4	783	594	36	0.21	0.8
634	500	11	0.19	0.8	734	560	558	0.11	0.5	784	594	596	0.27	0.8
635	500	504	0.30	0.9	735	562	604	0.10	0.3	785	596	618	0.22	0.7
636	502	504	0.25	1.9	736	562	544	0.50	2.0	786	596	598	0.28	1.7
637	502	502	0.0	0.0	737	562	564	0.21	0.9	787	596	584	0.27	0.8
638	502	470	0.0	0.0	738	562	594	0.17	0.5	788	596	668	0.26	0.8
639	504	500	0.30	1.2	739	564	566	0.19	0.6	789	598	596	0.28	1.7
640	504	506	0.07	0.4	740	564	562	0.21	0.9	790	598	622	0.27	1.1
641	504	502	0.25	1.9	741	564	616	0.22	0.7	791	598	600	0.48	1.2
642	504	510	0.13	0.4	742	564	634	0.12	0.4	792	600	602	0.43	1.4
643	506	504	0.07	0.4	743	566	618	0.19	0.5	793	600	73	0.43	1.7
644	506	508	0.35	1.0	744	566	568	0.24	1.0	794	600	636	0.26	0.6
645	506	9	0.12	0.5	745	566	564	0.19	0.6	795	600	598	0.48	1.2
646	508	516	0.26	0.6	746	568	566	0.24	1.0	796	602	600	0.48	1.4
647	508	516	0.25	1.0	747	568	570	0.26	1.5	797	602	638	0.48	1.0
648	508	10	0.10	0.4	748	568	724	0.26	0.3	798	602	670	0.49	1.0
649	510	504	0.13	0.4	749	570	562	0.36	1.5	799	606	562	0.10	0.3
650	510	9	0.07	0.3	750	570	33	0.31	1.2	800	606	546	0.29	0.9

FIGURE

FIGURE

FIGURE

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

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LINK NO.	ORIG NO.	DEST NO.	LINK DIST	LINK TIME	LINK SPEED	LINK NO.	ORIG NO.	DEST NO.	LINK DIST	LINK TIME	LINK SPEED	LINK NO.	ORIG NO.	DEST NO.	LINK DIST	LINK TIME	LINK SPEED
801	606	14	0.29	1.2	15.	851	640	642	0.43	0.9	29.	901	694	696	0.29	1.1	15.
802	608	616	0.26	0.8	20.	852	640	638	0.47	0.9	31.	902	694	768	0.35	1.0	21.
803	608	610	0.41	1.2	21.	853	640	632	0.48	1.2	24.	903	694	562	0.17	0.5	20.
804	608	14	0.20	0.8	15.	854	642	488	0.50	1.2	25.	904	694	564	0.12	0.3	24.
805	608	34	0.16	0.6	12.	855	642	640	0.48	1.0	29.	905	696	15	0.19	1.5	15.
806	610	612	0.25	1.0	15.	856	646	40	0.25	1.0	15.	906	696	698	0.22	0.9	15.
807	610	550	0.03	0.2	9.	857	646	39	0.27	1.1	15.	907	696	694	0.28	1.1	15.
808	610	608	0.41	1.2	21.	858	646	648	0.30	0.6	30.	908	698	770	0.37	0.9	25.
809	612	610	0.25	1.0	15.	859	646	578	0.51	1.1	28.	909	698	724	0.18	0.5	22.
810	612	614	0.08	0.3	16.	860	648	676	0.33	1.0	20.	910	698	700	0.20	0.7	17.
811	612	18	0.31	1.2	16.	861	648	668	0.36	0.9	24.	911	698	696	0.22	0.9	15.
812	614	612	0.08	0.3	16.	862	648	646	0.30	0.6	30.	912	700	16	0.29	1.2	15.
813	614	34	0.07	0.3	14.	863	648	650	0.73	1.3	34.	913	700	17	0.24	1.0	14.
814	616	566	0.18	0.5	22.	864	650	649	0.73	2.0	22.	914	700	702	0.37	1.3	17.
815	616	608	0.26	0.9	20.	865	650	686	0.18	0.4	27.	915	700	698	0.20	0.7	17.
816	616	564	0.22	0.7	19.	866	650	652	0.67	1.1	37.	916	702	746	0.52	1.2	26.
817	616	594	0.22	0.7	19.	867	652	672	0.37	0.9	25.	917	702	700	0.37	1.3	17.
818	618	36	0.27	1.1	15.	868	652	654	0.82	1.2	41.	918	702	704	0.40	1.0	24.
819	618	620	0.62	1.9	20.	869	652	650	0.67	1.3	31.	919	702	726	0.42	1.0	25.
820	620	618	0.62	1.9	20.	870	654	652	0.82	1.2	41.	920	704	706	0.20	0.6	20.
821	620	33	0.63	2.5	15.	871	658	648	0.36	0.9	24.	921	704	702	0.40	1.0	24.
822	620	35	0.13	0.5	16.	872	668	39	0.24	1.0	14.	922	704	44	0.05	0.2	15.
823	622	598	0.27	1.1	15.	873	668	596	0.26	0.8	20.	923	706	720	0.21	0.5	25.
824	622	624	0.56	1.3	26.	874	670	672	0.47	0.9	31.	924	706	704	0.20	0.6	20.
825	622	74	0.45	1.8	15.	875	670	602	0.49	1.0	29.	925	706	708	0.11	0.7	9.
826	624	626	0.14	0.3	28.	876	670	73	0.41	1.6	15.	926	706	772	0.12	0.3	24.
827	624	75	0.45	1.8	15.	877	672	670	0.47	0.9	31.	927	708	42	0.20	0.8	15.
828	624	622	0.56	1.3	26.	878	672	652	0.37	0.9	25.	928	708	710	0.32	0.7	27.
829	626	628	0.43	1.2	24.	879	674	676	0.30	0.9	20.	929	708	706	0.11	0.7	9.
830	626	624	0.14	0.3	28.	880	674	582	0.42	1.3	19.	930	710	45	0.23	1.1	15.
831	626	632	0.48	1.2	24.	881	674	40	0.23	0.9	15.	931	710	712	0.14	0.3	29.
832	626	35	0.14	0.5	14.	882	674	71	0.20	0.8	15.	932	710	708	0.32	0.7	27.
833	628	626	0.48	1.2	24.	883	676	678	0.28	0.7	24.	933	712	714	0.27	0.6	27.
834	628	480	0.50	1.5	20.	884	676	648	0.33	1.0	20.	934	712	730	0.41	1.0	25.
835	628	76	0.25	1.4	15.	885	676	674	0.30	0.9	20.	935	712	710	0.14	0.3	23.
836	630	484	0.48	1.4	21.	886	678	676	0.28	0.7	24.	936	712	774	0.27	0.6	27.
837	630	632	0.49	1.2	25.	887	678	71	0.28	1.1	15.	937	714	716	0.21	0.4	32.
838	630	76	0.13	0.5	16.	888	678	682	0.19	0.5	23.	938	714	712	0.27	0.6	27.
839	632	634	0.14	0.3	28.	889	680	71	0.19	0.8	14.	939	714	72	0.40	1.6	15.
840	632	626	0.48	1.2	24.	890	680	586	0.41	1.0	25.	940	716	732	0.33	0.9	25.
841	632	640	0.44	1.2	24.	891	680	682	0.30	0.7	26.	941	716	756	0.52	1.2	26.
842	632	630	0.49	1.2	25.	892	682	678	0.19	0.5	23.	942	716	714	0.21	0.4	32.
843	634	632	0.14	0.3	28.	893	682	680	0.30	0.7	26.	943	716	718	0.51	1.0	31.
844	634	75	0.0	0.0	0.	894	682	684	0.33	0.8	25.	944	718	776	0.27	0.6	27.
845	634	634	0.55	1.3	25.	895	684	686	0.55	1.3	25.	945	718	722	0.51	1.0	31.
846	636	600	0.26	0.6	26.	896	684	70	0.28	1.1	15.	946	718	734	0.27	0.6	27.
847	636	74	0.0	0.0	0.	897	684	682	0.33	0.9	25.	947	718	716	0.51	1.0	31.
848	636	634	0.55	1.3	25.	898	686	650	0.18	0.4	27.	948	722	777	0.23	0.5	34.
849	638	640	0.47	0.9	31.	899	686	70	0.25	1.0	16.	949	722	69	0.35	1.4	15.
850	638	602	0.48	1.0	29.	900	686	684	0.55	1.3	25.	950	722	718	0.51	1.0	31.

(CONT.)

FIGURE

(CONT.)

FIGURE

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

LINK NO.	ORIG NO.	DEST NO.	LINK DIST	LINK TIME	LINK SPEED	ORIG NO.	DEST NO.	LINK DIST	LINK TIME	LINK SPEED	ORIG NO.	DEST NO.	LINK DIST	LINK TIME	LINK SPEED
1001	750	752	0.52	1.2	26.	1051	777	722	0.28	0.5	1101	906	808	0.27	0.6
1002	750	743	0.45	1.2	23.	1052	778	300	0.07	0.5	1102	905	804	0.22	0.5
1003	752	750	0.52	1.2	26.	1053	778	780	0.22	1.0	1103	906	756	0.60	1.4
1004	752	45	0.25	1.0	15.	1054	778	1032	0.37	1.5	1104	903	810	0.24	0.7
1005	752	46	0.21	0.8	16.	1055	780	928	0.14	0.6	1105	903	82	0.2	0.2
1006	752	754	0.10	0.2	30.	1056	780	778	0.22	1.0	1106	908	308	0.27	0.7
1007	754	752	0.20	0.5	24.	1057	780	782	0.16	0.7	1107	908	60	0.39	1.6
1008	754	360	0.21	0.5	25.	1058	780	1032	0.14	0.6	1108	810	812	0.32	0.8
1009	754	774	0.25	0.6	25.	1059	782	4	0.0	0.0	1109	810	846	0.39	1.0
1010	754	754	0.43	1.3	22.	1060	782	780	0.16	0.7	1110	810	808	0.24	0.7
1011	756	756	0.40	1.4	26.	1061	782	734	0.13	0.5	1111	810	862	0.44	0.9
1012	756	716	0.52	1.2	26.	1062	782	4	0.0	0.0	1112	812	83	0.0	0.0
1013	756	754	0.43	1.3	22.	1063	784	782	0.13	0.5	1113	812	814	0.18	0.5
1014	756	758	0.26	0.8	20.	1064	784	786	0.16	0.6	1114	812	61	0.33	1.5
1015	758	66	0.0	0.0	0.	1065	784	990	0.14	0.6	1115	812	310	0.32	0.9
1016	758	750	0.25	0.6	25.	1066	784	938	0.14	0.4	1116	814	916	0.39	1.0
1017	758	755	0.26	0.6	25.	1067	784	788	0.22	0.9	1117	814	912	0.13	0.4
1018	760	762	0.33	0.8	25.	1068	786	19	0.10	0.4	1118	814	754	0.67	1.4
1019	760	962	0.20	0.4	30.	1069	786	784	0.16	0.6	1119	814	316	0.42	0.8
1020	760	776	0.25	0.6	25.	1070	786	786	0.22	0.9	1120	816	314	0.42	1.0
1021	760	758	0.25	0.6	25.	1071	788	790	0.14	0.6	1121	816	64	0.10	0.4
1022	762	760	0.23	0.3	25.	1072	788	20	0.06	0.2	1122	816	318	0.13	0.3
1023	762	75	0.22	0.9	25.	1073	790	1834	0.14	0.6	1123	818	815	0.13	0.3
1024	762	764	0.13	0.4	27.	1074	790	1104	0.15	0.4	1124	818	920	0.14	0.3
1025	762	67	0.22	0.9	15.	1075	790	792	0.15	0.4	1125	818	923	0.64	1.5
1026	764	762	0.19	0.4	27.	1076	790	789	0.14	0.6	1126	820	756	0.79	1.3
1027	764	814	0.67	1.4	29.	1077	792	794	0.37	1.0	1127	820	913	0.14	0.3
1028	764	760	0.25	0.6	25.	1078	792	790	0.15	0.4	1128	824	2	0.0	0.0
1029	764	764	0.25	0.6	25.	1079	792	21	0.12	0.5	1129	824	2	0.0	0.0
1030	766	820	0.73	1.3	36.	1080	794	792	0.37	1.0	1130	824	534	0.15	0.6
1031	766	777	0.26	0.4	39.	1081	794	796	0.19	0.6	1131	826	830	0.14	0.3
1032	768	738	0.15	0.4	23.	1082	794	22	0.08	0.3	1132	826	2	0.11	0.3
1033	768	15	0.23	1.1	15.	1083	796	852	0.26	0.8	1133	828	824	0.14	0.6
1034	768	13	0.22	1.1	15.	1084	796	794	0.19	0.6	1134	828	330	0.11	0.4
1035	768	934	0.35	1.0	21.	1085	796	796	0.20	0.5	1135	828	720	0.14	0.6
1036	770	742	0.12	0.3	24.	1086	796	22	0.07	0.3	1136	830	832	0.10	0.4
1037	770	16	0.22	0.9	15.	1087	798	47	0.12	0.5	1137	830	836	0.18	0.4
1038	770	15	0.22	0.9	15.	1088	798	796	0.90	2.2	1138	830	328	0.11	0.4
1039	770	695	0.37	0.9	25.	1089	798	800	0.20	0.5	1139	832	930	0.10	0.4
1040	772	704	0.12	0.3	24.	1090	800	802	0.08	0.2	1140	832	538	0.29	1.2
1041	772	750	0.42	1.2	21.	1091	800	792	0.20	0.5	1141	832	726	0.14	0.6
1042	772	44	0.20	0.3	15.	1092	800	858	0.16	0.4	1142	832	842	0.29	0.9
1043	774	754	0.25	0.6	25.	1093	802	800	0.08	0.2	1143	834	4	0.0	0.0
1044	774	45	0.07	0.3	14.	1094	802	868	0.12	0.3	1144	834	3	0.0	0.0
1045	774	712	0.27	0.6	27.	1095	802	804	0.29	0.7	1145	834	328	0.16	0.5
1046	776	67	0.24	1.0	14.	1096	802	860	0.32	0.8	1146	836	3	0.0	0.0
1047	776	740	0.25	0.6	25.	1097	804	526	0.22	0.5	1147	836	3	0.0	0.0
1048	776	716	0.27	0.6	27.	1098	804	48	0.30	1.2	1148	836	340	0.11	0.3
1049	776	766	0.26	0.4	39.	1099	804	802	0.28	0.6	1149	838	340	0.11	0.4
1050	777	67	0.35	1.4	15.	1100	806	880	0.36	0.9	1150	838	784	0.14	0.4

FIGURE (CONT.)

FIGURE (CONT.)

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

LINK NO.	ORIG. NODE	DEST. NODE	LINK DIST.	LINK TIME	LINK SPEED	LINK NO.	ORIG. NODE	DEST. NODE	LINK DIST.	LINK TIME	LINK SPEED
1401	1018	1066	0.40	0.8	30.	1501	1100	1098	0.26	0.5	31.
1402	1013	1020	0.35	0.8	26.	1502	1100	1156	0.41	1.6	15.
1403	1014	1016	0.40	0.9	27.	1503	1104	1070	0.40	0.9	27.
1404	1018	1148	0.45	1.1	25.	1504	1104	1106	0.14	0.3	28.
1405	1020	1022	0.32	0.6	32.	1505	1104	992	0.59	2.4	15.
1406	1020	1019	0.35	0.9	23.	1506	1104	790	0.15	0.4	23.
1407	1020	1150	0.46	1.1	25.	1507	1106	1104	0.14	0.6	14.
1408	1022	1020	0.32	0.6	32.	1508	1106	20	0.09	0.4	14.
1409	1022	154	0.47	1.9	15.	1509	1106	1138	0.22	0.6	22.
1410	1022	1024	0.19	0.4	29.	1510	1108	990	0.16	0.4	24.
1411	1024	1152	0.45	0.9	31.	1511	1108	1106	0.22	0.9	15.
1412	1024	1026	0.25	0.5	30.	1512	1108	19	0.05	0.2	15.
1413	1024	1022	0.19	0.4	29.	1513	1110	1074	0.34	0.7	29.
1414	1024	1024	0.25	0.5	30.	1514	1110	1118	0.30	0.9	20.
1415	1026	156	0.45	1.8	15.	1515	1110	1112	0.24	0.6	24.
1416	1026	150	0.15	0.6	15.	1516	1112	1114	0.19	0.6	19.
1417	1022	780	0.14	0.6	14.	1517	1112	110	0.23	0.9	15.
1418	1032	990	0.29	0.7	25.	1518	1112	1110	0.24	0.9	24.
1419	1032	772	0.37	1.5	15.	1519	1114	1116	0.13	0.5	22.
1420	1032	1034	0.10	0.5	10.	1520	1114	1112	0.19	0.6	19.
1421	1034	1036	0.07	0.3	14.	1521	1116	1110	0.19	0.7	15.
1422	1034	992	0.29	0.7	25.	1522	1116	1114	0.13	0.5	22.
1423	1034	1038	0.26	0.6	9.	1523	1116	1123	0.17	0.5	20.
1424	1034	1032	0.10	0.6	10.	1524	1118	1122	0.22	0.7	19.
1425	1036	5	0.06	0.2	13.	1525	1118	112	0.25	1.0	15.
1426	1036	948	0.15	0.6	15.	1526	1118	1110	0.30	0.9	20.
1427	1038	5	0.09	0.3	16.	1527	1118	110	0.20	0.3	15.
1428	1038	1040	0.15	0.9	10.	1528	1120	1076	0.19	0.5	23.
1429	1038	1034	0.06	0.4	9.	1529	1120	1076	0.19	0.5	23.
1430	1040	1042	0.17	0.5	20.	1530	1120	1122	0.22	0.5	25.
1431	1040	1038	0.15	0.9	10.	1531	1120	1122	0.22	0.5	25.
1432	1040	2010	0.25	1.0	15.	1532	1122	1118	0.22	0.7	19.
1433	1040	952	0.11	0.4	17.	1533	1122	1124	0.21	0.5	25.
1434	1042	1040	0.17	0.5	20.	1534	1124	1134	0.18	0.5	22.
1435	1042	6	0.07	0.2	21.	1535	1124	1122	0.21	0.5	25.
1436	1042	934	0.13	0.4	20.	1536	1124	110	0.21	0.3	15.
1437	1050	1004	0.29	1.2	15.	1537	1124	1126	0.07	0.2	21.
1438	1050	134	0.14	0.6	14.	1538	1126	1124	0.07	0.2	21.
1439	1050	1802	0.05	0.3	10.	1539	1126	1130	0.11	0.3	22.
1440	1054	1804	0.20	0.6	20.	1540	1126	111	0.16	0.6	16.
1441	1054	948	0.05	0.1	30.	1541	1128	1130	0.07	0.2	21.
1442	1054	117	0.05	0.2	15.	1542	1128	1116	0.17	0.5	23.
1443	1050	974	0.14	0.6	15.	1543	1130	1132	0.17	0.5	20.
1444	1050	1505	0.10	0.4	15.	1544	1130	1125	0.11	0.3	22.
1445	1050	972	0.20	0.8	15.	1545	1130	1136	0.19	0.5	19.
1446	1054	145	0.13	0.5	16.	1546	1130	1128	0.07	0.2	21.
1447	1054	1315	0.40	0.8	30.	1547	1132	1130	0.17	0.7	15.
1448	1066	122	0.10	0.2	30.	1548	1132	105	0.19	0.3	14.
1449	1066	122	0.37	1.5	15.	1549	1132	1000	0.13	1.1	10.
1450	1063	1312	0.20	0.4	30.	1550	1134	1124	0.18	0.7	15.

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

LINK NO.	ORIG. NODE	DEST. NODE	LINK NO.	LINK SPEED	LINK DIST.	LINK TIME	ORIG. NODE	DEST. NODE	LINK NO.	LINK SPEED	LINK DIST.	LINK TIME	ORIG. NODE	DEST. NODE	LINK NO.	LINK SPEED	LINK DIST.	LINK TIME
1601	1164	1162	0.60	1.0	0.60	0.8	1204	1202	0.27	0.27	0.8	20.	1701	1236	135	0.42	1.7	15.
1602	1165	1154	0.50	0.9	0.50	0.3	1206	123	0.07	0.07	0.3	14.	1702	1236	131	0.11	0.4	17.
1603	1166	161	0.08	0.3	0.08	1.1	1206	1208	0.45	0.45	1.1	25.	1703	1236	1239	0.25	0.6	25.
1604	1166	162	0.64	2.6	0.64	0.8	1206	1204	0.20	0.20	0.8	15.	1704	1238	1240	0.10	0.2	30.
1605	1174	1175	0.20	0.5	0.20	1.0	1208	129	0.26	0.26	1.0	16.	1705	1238	1224	0.53	1.3	24.
1606	1174	321	0.09	0.5	0.09	1.0	1208	1210	0.41	0.41	1.0	25.	1706	1238	1236	0.25	0.6	25.
1607	1175	951	0.10	0.6	0.10	1.3	1208	1206	0.45	0.45	1.3	21.	1707	1240	131	0.25	1.0	15.
1608	1190	1132	0.40	1.0	0.40	0.5	1210	1212	0.20	0.20	0.5	24.	1708	1240	1242	0.13	0.3	25.
1609	1140	1200	0.60	1.2	0.60	1.3	1210	128	0.32	0.32	1.3	15.	1709	1240	1238	0.10	0.2	30.
1610	1130	2005	0.09	0.5	0.09	1.0	1210	1208	0.41	0.41	1.0	25.	1710	1242	1272	0.27	1.0	16.
1611	1132	1130	0.42	1.6	0.42	1.1	1212	972	0.45	0.45	1.1	25.	1711	1242	1240	0.13	0.3	24.
1612	1132	107	0.22	0.9	0.22	0.6	1212	1222	0.28	0.28	0.6	28.	1712	1242	1244	0.36	0.7	31.
1613	1132	1134	0.23	0.6	0.23	0.5	1212	1214	0.27	0.27	0.5	32.	1713	1244	132	0.48	1.9	15.
1614	1134	1136	0.30	0.7	0.30	0.5	1212	1210	0.20	0.20	0.5	24.	1714	1244	1242	0.36	0.7	31.
1615	1134	1266	0.40	1.0	0.40	1.0	1214	143	0.24	0.24	1.0	14.	1715	1244	1246	0.21	0.4	32.
1616	1134	1182	0.23	0.8	0.23	1.0	1214	1216	0.50	0.50	1.0	30.	1716	1244	141	0.44	1.8	15.
1617	1134	1184	0.20	2.0	0.20	0.5	1214	1212	0.27	0.27	0.5	32.	1717	1246	1243	0.24	0.5	29.
1618	1136	109	0.17	0.7	0.17	1.0	1216	979	0.33	0.33	1.0	20.	1718	1246	1244	0.21	0.4	32.
1619	1136	1193	0.42	1.0	0.42	0.4	1216	1226	0.20	0.20	0.4	30.	1719	1246	1328	0.44	0.9	29.
1620	1136	1275	0.11	0.3	0.11	0.0	1216	1214	0.50	0.50	0.0	30.	1720	1246	1279	0.25	0.6	25.
1621	1136	1190	0.27	0.6	0.27	0.3	1218	1204	0.07	0.07	0.3	14.	1721	1248	1250	0.24	0.5	29.
1622	1136	1274	0.17	0.4	0.17	0.8	1218	123	0.19	0.19	0.8	14.	1722	1248	133	0.24	1.0	14.
1623	1136	1134	0.42	1.5	0.42	1.5	1218	1220	0.75	0.75	1.5	25.	1723	1248	1246	0.24	1.0	14.
1624	1140	133	0.24	1.0	0.24	0.7	1220	1219	0.75	0.75	0.7	24.	1724	1250	1252	0.17	0.4	26.
1625	1140	1192	0.23	0.6	0.23	0.8	1220	109	0.20	0.20	0.8	15.	1725	1250	1310	0.40	1.0	24.
1626	1140	1138	0.27	0.3	0.27	0.0	1220	1192	0.40	0.40	0.0	24.	1726	1250	1254	0.24	0.6	24.
1627	1140	1194	0.09	0.3	0.09	0.4	1220	124	0.18	0.18	0.4	27.	1727	1250	1243	0.24	0.5	29.
1628	1142	1190	0.23	0.7	0.23	0.8	1222	128	0.20	0.20	0.8	15.	1728	1252	1250	0.19	0.5	23.
1629	1142	1230	0.24	0.5	0.24	1.5	1222	143	0.38	0.38	1.5	15.	1729	1252	1254	0.23	0.6	23.
1630	1142	1220	0.40	1.0	0.40	0.7	1222	1212	0.29	0.29	0.7	24.	1730	1252	125	0.24	1.0	14.
1631	1142	1194	0.19	0.5	0.19	0.6	1224	127	0.16	0.16	0.6	16.	1731	1254	1256	0.13	0.3	26.
1632	1144	125	0.24	1.0	0.24	1.5	1224	1222	0.83	0.83	1.5	33.	1732	1254	1252	0.23	0.5	23.
1633	1144	1196	0.43	0.9	0.43	1.5	1224	114	0.38	0.38	1.5	15.	1733	1254	126	0.37	1.5	15.
1634	1144	1192	0.19	0.6	0.19	0.4	1224	147	0.10	0.10	0.4	15.	1734	1256	1254	0.13	0.3	26.
1635	1146	938	0.0	0.0	0.0	0.4	1226	147	0.20	0.20	0.4	30.	1735	1256	1253	0.54	1.1	29.
1636	1146	1196	0.37	0.7	0.37	1.5	1226	1215	0.20	0.20	1.5	15.	1735	1256	1256	0.38	0.8	29.
1637	1146	125	0.13	0.5	0.13	2.0	1226	143	0.39	0.39	2.0	30.	1736	1256	1332	0.55	1.1	30.
1638	1146	1194	0.43	1.0	0.43	1.7	1226	1228	1.01	1.01	1.7	15.	1737	1256	1332	0.55	1.1	30.
1639	1146	1224	0.29	0.6	0.29	2.0	1228	144	0.43	0.43	2.0	30.	1738	1258	132	0.10	0.4	15.
1640	1148	1292	0.14	0.3	0.14	1.2	1228	1226	1.01	1.01	1.2	31.	1739	1258	144	0.60	2.4	15.
1641	1148	1194	0.37	0.6	0.37	1.9	1230	1232	0.62	0.62	1.9	10.	1740	1258	1256	0.54	1.1	29.
1642	1200	960	0.41	1.2	0.41	0.5	1230	2005	0.32	0.32	0.5	25.	1741	1254	1264	0.26	0.6	25.
1643	1200	1202	0.24	0.9	0.24	1.0	1230	107	0.12	0.12	1.0	16.	1742	1264	1264	0.14	0.6	14.
1644	1200	1190	0.60	1.8	0.60	0.6	1232	130	0.26	0.26	0.6	16.	1743	1264	131	0.26	1.0	16.
1645	1202	1204	0.27	0.8	0.27	1.9	1232	1234	0.21	0.21	1.9	20.	1744	1264	130	0.20	0.8	15.
1646	1202	1200	0.34	0.8	0.34	0.6	1232	1230	0.62	0.62	0.6	26.	1745	1340	1332	0.27	0.6	27.
1647	1202	1204	0.45	1.4	0.45	0.3	1234	1232	0.21	0.21	0.3	29.	1746	1340	1266	0.15	0.4	23.
1648	1204	1206	0.20	0.5	0.20	1.0	1234	1264	0.14	0.14	1.0	25.	1747	1340	1266	0.23	0.5	23.
1649	1204	1219	0.07	0.3	0.07	0.8	1234	1322	0.42	0.42	0.8	20.	1748	1340	1266	0.15	0.4	23.
1650	1204	1219	0.07	0.3	0.07	0.8	1236	1234	0.26	0.26	0.8	20.	1750	1253	1274	0.27	0.5	27.

(CONT.)

FIGURE

(CONT.)

FIGURE

LISTING OF NODES, LINKS, SPEED, DISTANCE AND TIME
OF THE STREETNETWORK OF THE CITY OF EDMONTON

PAGE 19

LINK NO.	ORIG NODE	DEST NODE	LINK DIST	LINK TIME	LINK SPEED	LINK NO.	ORIG NODE	DEST NODE	LINK DIST	LINK TIME	LINK SPEED
1801	1304	1326	0.19	0.5	23.	1842	1808	1810	0.35	1.0	21.
1802	1304	1302	0.38	0.8	29.	1843	1808	1806	0.35	0.8	26.
1803	1306	140	0.13	0.5	16.	1844	1808	1060	0.10	0.4	15.
1804	1306	1308	0.14	0.3	28.	1845	1810	122	0.27	1.1	15.
1805	1306	1304	0.10	0.2	30.	1846	1810	1812	0.31	0.7	27.
1806	1308	139	0.40	1.6	15.	1847	1810	1808	0.35	1.0	21.
1807	1308	1306	0.14	0.3	28.	1848	1812	1066	0.10	0.2	30.
1808	1308	1310	1.05	2.1	30.	1849	1812	1068	0.20	0.4	30.
1809	1310	1328	0.59	1.2	30.	1850	1812	1810	0.31	0.7	27.
1810	1310	1308	1.08	2.2	29.	1851	1884	790	0.14	0.3	28.
1811	1322	1234	0.42	1.0	25.	1852	1884	21	0.15	0.6	15.
1812	1322	135	0.30	1.2	15.	1853	1884	846	0.21	0.8	16.
1813	1322	1292	0.34	1.0	20.	1854	2000	2010	1.55	3.1	30.
1814	1324	1326	0.31	0.7	27.	1855	2000	1070	0.08	0.2	24.
1815	1324	1238	0.53	1.3	24.	1856	2000	2001	0.48	0.7	41.
1816	1324	139	0.10	0.4	15.	1857	2001	2000	0.24	0.4	36.
1817	1326	140	0.09	0.4	14.	1858	2001	1074	0.24	0.4	36.
1818	1326	1304	0.19	0.5	23.	1859	2007	1292	0.23	0.6	23.
1819	1326	1324	0.31	0.7	27.	1860	2003	1128	0.35	1.0	21.
1820	1328	1310	0.59	1.2	30.	1861	2003	994	0.71	2.1	20.
1821	1328	1246	0.44	1.1	24.	1862	2003	2011	0.45	1.7	16.
1822	1328	141		0.6	16.	1863	2004	1286	0.45	1.8	15.
1823	1330	142		0.3	14.	1864	2004	1175	0.20	1.2	10.
1824	1330	1250	0.40	1.0	24.	1865	2004	2005	0.20	0.6	20.
1825	1332	1256	0.55	1.1	30.	1866	2004	951	0.26	1.0	16.
1826	1332	1330	0.27	0.6	27.	1867	2005	1230	0.32	1.0	19.
1827	1800	104	0.04	0.2	12.	1868	2005	2004	0.20	1.2	10.
1828	1800	999	0.16	0.5	19.	1869	2005	1180	0.09	0.2	27.
1829	1800	1802	0.14	0.4	21.	1870	2006	2007	0.23	0.6	23.
1830	1802	1800	0.14	0.4	21.	1871	2007	2006	0.23	0.8	17.
1831	1802	1050	0.05	0.3	10.	1872	2008	2009	0.27	0.5	32.
1832	1802	964	0.21	1.3	10.	1873	2008	372	0.66	1.1	36.
1833	1802	1804	0.38	1.5	15.	1874	2009	374	0.44	0.8	33.
1834	1804	1054	0.20	0.6	20.	1875	2009	2008	0.27	0.5	32.
1835	1804	1006	0.30	0.7	26.	1876	2010	1040	0.25	1.0	15.
1836	1804	1802	0.36	1.4	15.	1877	2010	954	0.18	0.5	22.
1837	1804	1806	0.58	1.4	25.	1878	2010	2011	0.28	0.8	21.
1838	1806	1808	0.35	0.8	26.	1879	2010	2000	1.55	3.1	30.
1839	1806	119	0.16	0.6	16.	1880	2011	2010	0.28	0.8	21.
1840	1806	1804	0.58	1.4	25.	1881	2011	960	0.45	1.9	14.
1841	1808	1012	0.30	0.7	26.	1882	2011	2003	0.45	1.1	25.
1842	1808	1810	0.35	1.0	21.	1883	352	23	0.10	0.2	30.

FIGURE. (CONT.)

PROGRAMME COMPLETED

APPENDIX G

POPULATION AND EMPLOYMENT OF EDMONTON

FOR 1961, 1964 AND 1967

[illegible]

TABLE G - 1 (cont'd)

G2

POPULATION AND EMPLOYMENT OF EDMONTON

<u>ORIGIN</u>		<u>POPULATION</u>				<u>EMPLOYMENT</u>					
Cent	Zone	<u>1961</u>	<u>1961</u>	<u>1964</u>	<u>1967</u>	<u>1961</u>		<u>1964</u>		<u>1967</u>	
		Census	O-D			No	%	No	%	No	%
36	0710	2582	2480	2445	2466	710	28.6	714	29.2	731	29.6
37	0720	4628	4340	4984	5409	1610	37.0	1766	35.4	1369	25.3
38	0730	4495	4520	4828	4879	1470	32.5	1370	28.4	1509	30.9
39	0810	4512	4770	4368	4396	1240	26.0	1278	29.3	1160	26.3
40	0820	3853	3640	3851	3678	1030	28.3	1245	34.4	1248	33.9
41	0830	2532	2660	2566	2441	660	24.8	652	25.4	721	29.5
42	0840	672	710	627	652	140	19.7	241	38.5	77	11.8
43	0850	-	-	-	-	-	-	-	-	-	-
44	0860	4110	4300	4115	4130	1390	32.3	1110	27.0	1563	37.8
45	0870	5511	5850	5307	5411	1570	26.8	1558	29.5	1436	26.5
46	0880	4991	4490	4704	4544	1330	29.6	1520	32.3	1584	34.8
47	0910	2139	1930	2117	2169	510	26.4	602	28.5	533	24.5
48	0920	3243	3240	3119	3062	820	25.3	913	29.3	419	13.6
49	0930	5079	5970	6111	5911	1540	25.8	1592	26.1	1629	29.8
50	0940	2529	1320	2688	3497	360	27.3	656	24.7	783	22.3
51	0950	-	-	-	-	-	-	-	-	-	-
52	0960	0	-	0	600	-	-	-	-	176	29.3
53	1010	2289	2220	5127	7276	520	23.4	1216	23.7	1378	18.9
54	1015	-	-	-	-	-	-	-	-	-	-
55	1020	3942	3690	4133	4193	870	21.1	862	20.8	1260	30.0
56	1031	1387	1380	4098	5844	290	21.0	998	24.4	1438	24.6
57	1032				957					139	14.5
58	1041	2106	1970	3461	1977	450	22.8	343	9.9	282	14.2
59	1042				1000					251	25.1
60	1110	2499	2670	2529	2642	410	22.8	158	6.4	629	23.8
61	1120	2767	2790	2938	3113	510	18.3	734	25.0	944	30.3
62	1130	777	790	745	1087	200	25.3	196	26.3	785	72.2
63	1140	1325	1220	1079	947	220	18.0	426	39.5	200	21.1
64	1145	-	-	-	-	-	-	-	-	-	-
65	1150	3958	3980	4219	4207	880	22.1	920	21.8	858	20.3
66	1160	4777	4770	5044	5332	840	17.6	808	16.1	1327	24.8
67	1170	3329	3350	3442	3794	830	24.8	684	19.9	1107	29.1
68	1180	0	-	0	300	-	-	-	-	80	26.6
69	1190	0	-	0	243	-	-	-	-	78	32.0
70	1210	-	-	-	-	-	-	-	-	33	103.1
71	1220	-	-	-	32	-	-	-	-		
72	1230	-	-	-	-	-	-	-	-		

TABLE G - 1 (cont'd)

POPULATION AND EMPLOYMENT OF EDMONTON

ORIGIN		POPULATION				EMPLOYMENT					
Cent	Zone	1961	1961	1964	1967	1961		1964		1967	
		Census	0-D			No	%	No	%	No	%
73	1310	7863	8160	8595	8709	1910	23.4	2332	27.2	1998	22.9
74	1320	5340	5160	5942	6102	1240	24.0	1853	31.3	1304	21.3
75	1330	3005	3080	4731	5848	560	18.2	1347	28.5	1304	22.2
76	1340	3204	3300	6904	7097	880	26.7	2004	29.0	2025	28.5
77	1410	1750	1750	4106	4575	440	25.1	1281	31.2	1163	25.4
78	1415	-	-	-	-	-	-	-	-	-	-
79	1421	4996	2930	8586	8641	610	20.9	1915	28.0	2006	23.2
80	1431	1968	1640	1000	7155	370	22.5	735	27.1	1692	23.6
81	1440	2089	2170	3197	4686	450	20.7	827	26.0	1019	21.7
82	1510	-	-	-	-	-	-	-	-	-	-
83	1520	5066	4590	4698	4564	1090	23.7	1390	29.6	2052	44.9
84	1530	-	-	-	-	-	-	-	-	-	-
85	1540	3426	3430	3352	3293	880	25.7	1060	31.7	996	30.2
86	1550	230	120	213	190	40	30.0	76	35.0	76	40.0
87	1610	-	-	-	-	-	-	-	-	-	-
88	1620	5300	5300	5526	5678	840	15.8	1335	24.2	1022	17.9
89	1630	3640	3640	4655		880	24.2	1207	25.9		
90	1710	-	-	-	5242	-	-	-	-	1579	30.1
91	1720	-	-	-	-	-	-	-	-	-	-
92	1810	-	-								
93	1820	-	-								
94	1830	-	-	157	156					23	14.7
96	1840	-	-								
95	1850	-	-								
97	1860	-	-								
98	1910	-	-	-	-					-	-
99	1920	-	-	-	1711					858	50.1
100	1930	-	-	-	1563					431	27.5
101	1940	-	-	-	900					212	23.5
102	1950	-	-	-	-					-	
103	1960	-	-	-	-					-	
NORTH SIDE		20815	203940	227294	255479	54400	26.7	61202	26.9	70930	27.8

TABLE G - 1 (cont'd)

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POPULATION AND EMPLOYMENT OF EDMONTON

ORIGIN		POPULATION				EMPLOYMENT					
Cent	Zone	1961 Census	1961 O-D	1964	1967	1961		1964		1967	
						No	%	No	%	No	%
104	2010	3514	3430	3507	4239	930	27.1	866	24.8	1066	25.1
105	2020	3989	3280	3716	4999	1060	32.3	884	23.8	698	13.9
106	2110	6036	6030	5719	6071	1740	28.9	1713	29.6	1969	32.4
107	2120	1710	1710	1625	1461	460	26.9	403	24.8	335	22.9
108	2130	3745	3890	3277	2819	850	21.9	1171	35.7	709	25.1
109	2140	2344	1850	2186	2260	580	31.3	555	25.4	469	20.7
110	2211	-	-	-	600	-	-	-	-	-	-
111	2212	-	-	1420	1665	-	-	-	-	-	-
112	2220	2677	1950	1894	1796	480	24.5	374	19.8	392	21.8
113	2230	4081	3880	3942	3894	1030	26.5	735	18.7	760	19.5
114	2240	-	-	-	-	-	-	-	-	-	-
115	2250	40	-	973	1596	-	-	171	17.6	351	21.9
116	2310	4672	4430	4142	4057	1380	31.2	1124	27.2	1321	32.5
117	2320	2303	2230	2242	2169	600	26.9	634	28.3	414	19.0
118	2330	3752	5280	3447	3379	1410	26.7	969	28.1	1007	29.8
119	2340	2981	1570	2865	2528	370	23.6	899	31.4	743	29.3
120	2350	1772	1680	1683	1635	420	25.0	469	27.7	358	21.8
121	2360	871	920	2028	2656	130	14.1	452	22.2	797	30.0
122	2370	1433	1500	2885	2520	400	26.7	752	26.1	461	18.2
123	2410	3122	3250	3010	2785	1200	36.9	971	32.3	747	26.8
124	2420	2792	2870	2658	2612	720	25.1	653	25.5	1019	39.0
125	2430	2612	2450	2508	2448	630	25.7	736	29.4	649	26.5
126	2440	3567	3210	3670	3603	550	17.2	1025	27.9	1195	33.1
127	2450	1524	-	1446	1489	-	-	413	28.6	153	10.2
128	2460	3509	3160	3487	3382	920	29.1	1063	30.5	479	14.1
129	2470	5311	5030	5010	4818	1100	21.9	1300	26.0	1681	34.8
130	2510	2784	2480	2665	2504	740	29.8	678	25.5	204	8.1
131	2520	3091	2950	3121	3159	780	26.5	833	26.7	849	26.8
132	2530	4945	4770	5526	4652	1290	26.5	1361	24.6	1374	29.5
133	2540	2267	2070	2258	2179	620	29.8	754	33.4	645	29.6
134	2550	-	-	-	-	-	-	-	-	-	-
135	2610	3453	3240	3441	3627	770	23.8	961	27.2	1154	31.8
136	2620	2235	2080	2768	2814	460	22.1	840	30.4	926	32.9
137	2630	5139	4710	5479	5548	1240	26.2	1337	24.4	1472	26.5
138	2640	7432	7230	7797	7880	1890	26.1	2053	26.4	1886	23.9

TABLE G - 1 (cont'd)

POPULATION AND EMPLOYMENT OF EDMONTON

ORIGIN		POPULATION				EMPLOYMENT					
Cent	Zone	1961	1961	1964	1967	1961		1964		1967	
		Census	0-D			No	%	No	%	No	%
139	2710	2035	1930	4374	5168	470	24.4	1285	29.4	1711	33.1
140	2715	-	-	-	-	-	-	-	-	-	-
141	2720	677	600	6865	10502	150	25.0	1791	26.1	3050	29.0
142	2730	-	-	-	864	-	-	-	-	233	26.9
143	2810	97	-	-	-						
144	2820		-	-	-						
145	2910	-	-	900	900						
146	2920	371	-	-							
147	2930		-	-	282						
148	2940		-	-							
149	2950		-	-	246						
150	2960		-	-	226						
151	3010	17	310	2365	3046	50	16.1	668	28.2	574	18.8
152	3015	-	-	-	-	-	-	-	-	-	-
153	3021	160	-	-	3076						
154	3022		-	-	2456						
155	3030		-	-	846						
156	3040		-	-	3021						
157	3050	4	-	-	2665						
158	3110	124	-	-	87						
159	3120		-	-							
160	3130		-	-							
161	3140	13	-	-							
162	3150		-	-							
163	3160		-	-							
SOUTH SIDE		10301	96080	116171	137726	25420	26.5	30158	26.0	35254	26.0
TOTAL		308916	300020	343465	393205	79820	26.6	91360	26.6	106184	27.0

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